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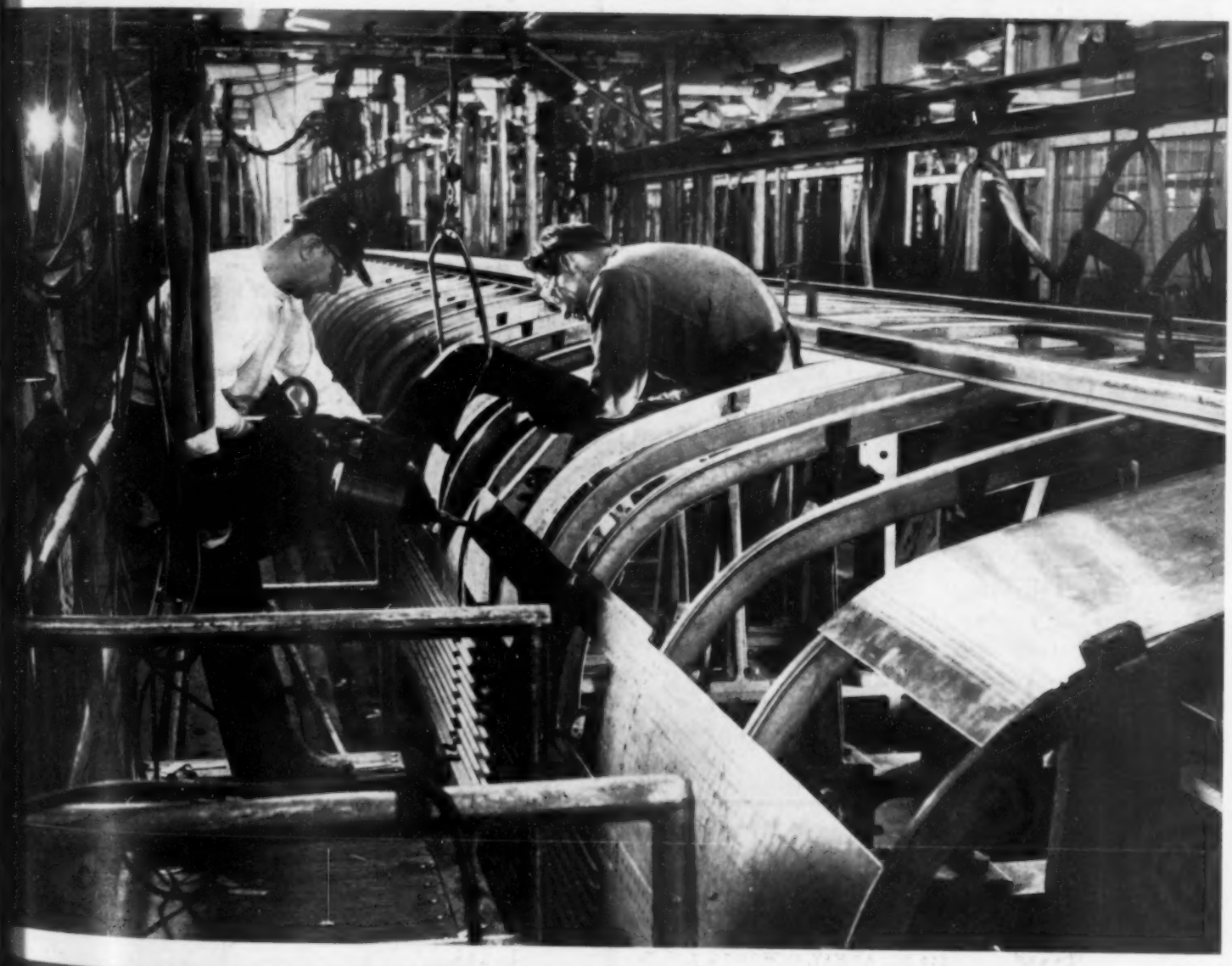
The WELDING Journal



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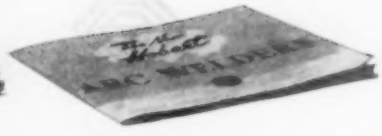

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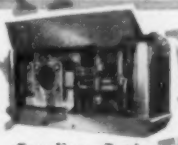

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Published for the Advancement of the Science and Art of Welding

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COVER

Workmen weld stainless steel section to railroad passenger car roof. *Courtesy, The Budd Company.*

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Subscriptions $5.00 per year in United States and possessions; Foreign Countries $7.00. Single copies, non-members $.75; Special issue October $1.00; members 50 cents.

Entered as second-class matter January 15, 1932, at the post-office at Easton, Pa., under the act of March 3, 1879.

PUBLICATION OFFICE
20th & Northampton Streets, Easton, Pa.
EDITORIAL AND GENERAL OFFICES
33 West 39th St., New York 18, N. Y.

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VOLUME 26 · NUMBER 9 · SEPTEMBER 1947

Welded Steel Furniture

By Dan Raffone*

WELDING has come to play a very important part in the fabrication of metal furniture resulting in increased production, improved handling methods and reduced costs as well as improving the quality of the finished merchandise.

The various methods of welding used here at the Simmons Company plant in Kenosha, Wis., are as follows: arc welding, spot welding, flash welding, seam welding, acetylene welding and brazing, gun welding and projection welding.

We began to utilize welding as an important production tool back in the years 1916 and 1917 at which time there were designed and built here in our plant various tube drawing benches in which steel strip was formed and welded together utilizing the resistance welding method. We have approximately 20 of these draw benches in operation at our plant today, each producing an average of between 45 to 110 ft. of tubing per minute.

Figure 1 shows a rear view of one of our draw benches. Note the various forming rolls through which the steel strip is passed prior to welding as well as the spot welder for joining the strip.

Figure 2 shows the welding head as well as the scarfing tool. The welding head on these machines do part of the last forming operations as well as welding of the tubing.

Figure 3 shows the straightening as well as the forming rolls with the draw tongs pulling the tubing down the draw bench. These draw benches extend from 90 to 100 ft. in length. All of our mild steel tubing, regardless of size or shape, used in the manufacturing of metal furniture is made on these machines.

* Welding Engineer, Simmons Co., Kenosha, Wis.

Figure 4 shows another type of welding machine that was designed and built here at approximately the same time. As a note of explanation, at our plant here at Kenosha, Wis., we have a Rolling Mill in which we reroll railroad rails. These rails are broken into 8 to 10 ft.

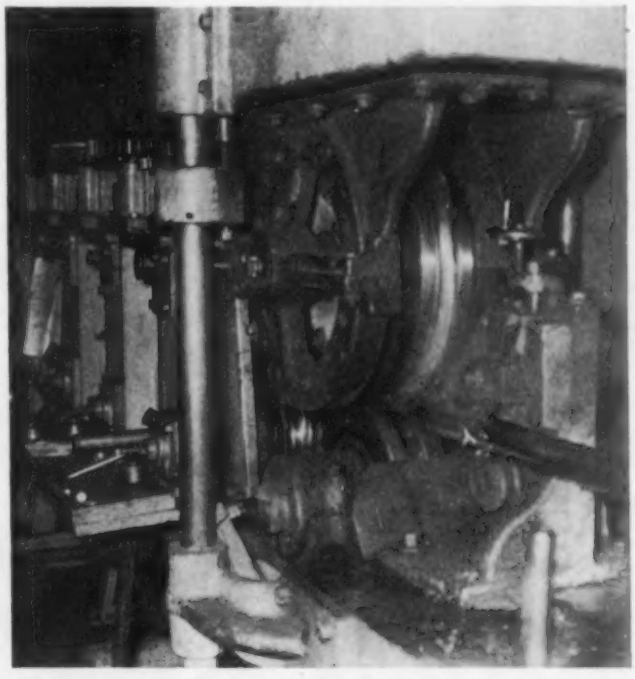


Fig. 2—Welding Head

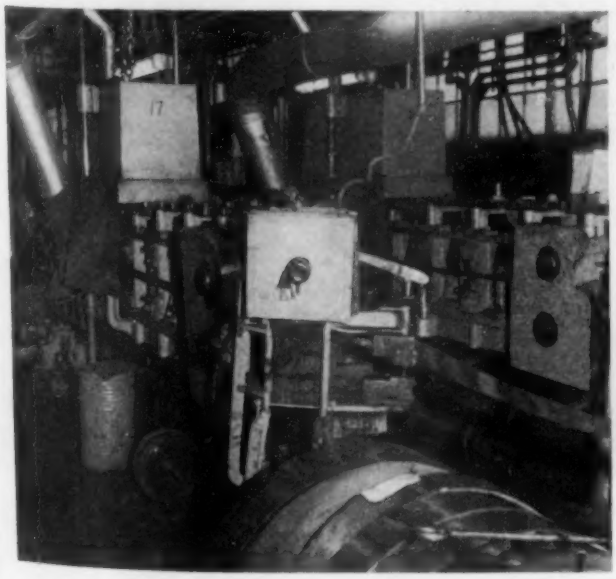


Fig. 1—Rear View of Draw Benches

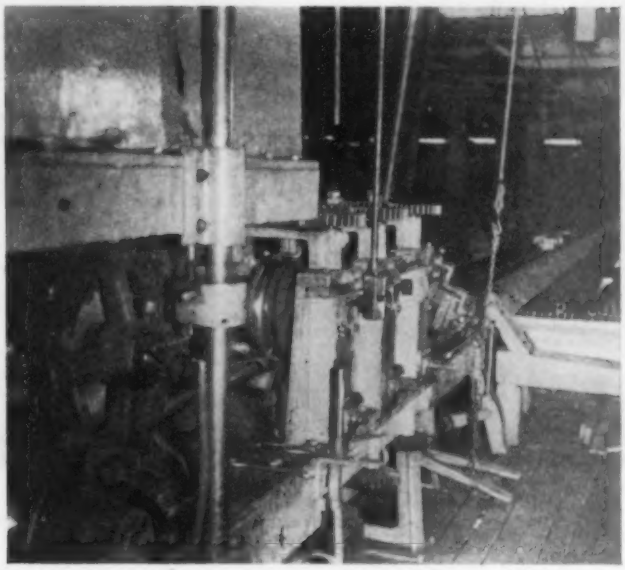


Fig. 3—Straightening and Forming Rolls

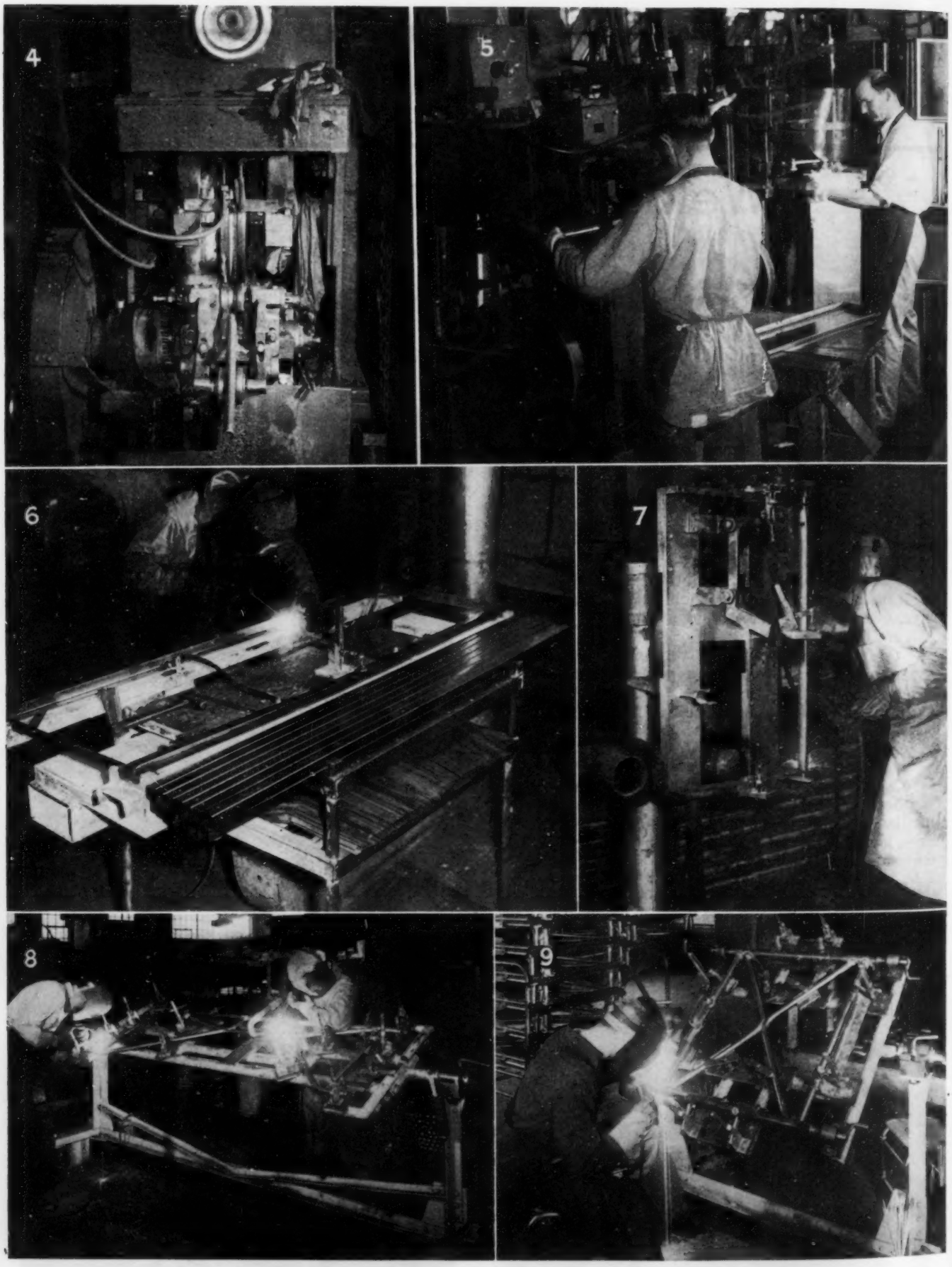


Fig. 4—Another Type Welding Machine
Fig. 5—Spot Welding Machines
Fig. 6—Welding Studio Couch Frames

Fig. 7—Welding Elevator Frame for Hospital Bed
Fig. 8—Welding Side Member of an Aircraft Servicing Stand
Fig. 9—End Member of Aircraft Service Stand

lengths and heated in the furnace, after which they are passed through a slitter which slits the rails in three sections—head, web and flange. Out of the flange of the rail we draw this oval shaped tubing which you see here being welded electrically in one of our welding machines. Before welding this tubing, it is passed through a sand blast machine which sand blasts an area of approximately $^1/_2$ in. on either side of the seams removing all rust scale, etc. This oval shaped tubing is used as side rails for some of our bed springs, resulting in a nice rigid high carbon steel construction.

The carbon content of our reroll rail stock varies from 0.35 to 0.85% carbon which as is known presents a few problems of its own when considering the various welding processes.

During that same period between 1916 to 1918 when they became welding conscious here at the plant, they were also designing and building spot welding machines which you will see in Figure 5. Since that time we have built approximately 100 or so of these machines for our various plants. As will be noted, although they are not of the latest designs, they have given us quite satisfactory performance.

We have begun in the last few years to replace much of this old equipment with modern spot-welding machines which will give us better control regarding heat, timing and pressure.

The men you see here are assembling and spot-welding drawers for our metal furniture. In order to eliminate additional handling and trucking, we have established a sort of a line system consisting of five operators. The first operator spot welds the runners to both the left and right sides passing them to the second operator, who attaches the left side to the drawer front. It is then passed to the next operator, who spot welds the right side to the drawer front and then placed on the bench directly behind the two operators. When they have twenty partially completed drawers, the two men slide in the bottom and attach the back to the drawer one man welding the back to the left side and the other operator welding the back to the right side. The next operation is brazing the four upper corners of the drawer as well as placing two spots in the lower corner to hold the bottom sheet in its place.

This is done so that when spot welding the bottom in the drawer, the bottom will not fall out. The next operator spot welds the center guide and bottom to the drawer. We have two such setups in operation producing a total of 725 drawers per 8-hr. shift.

We have recently ordered a multi-point automatic spot-welding unit, which, with one operator, will be able to produce these same drawers at the rate of 100 units per hour, simultaneously eliminating part of the brazing operation which will reduce the cost, as well as increase the volume of production. With this new method an operator assembles the parts of the drawer in an expanding fixture, presses a button which automatically brings the fixture into a welding position and after welding is ejected from the machine. The operator removes the drawer, hangs it on an overhead conveyer and repeats the operation. One of the most important features of this automatic welding unit is that every drawer is exactly alike dimensionally, eliminating a lot of drawer fitup time, and naturally reducing the cost of the entire unit.

Another method of welding used here in our plant which has grown by leaps and bounds in the last few years is arc welding. Many of our arc-welding operations are done on rerolled rail stock which, as stated previously, has a carbon content varying from 0.35 to 0.85%. This at first created quite a problem. We experienced considerable difficulties when welding rerolled rail stock due to underbead cracking and cracking adjacent to the weld.

We have been able to overcome most of this by using the following procedure which we have developed here at our plant. In welding our studio couch frames, for example, which is shown in Fig. 6, we do not strive for too close of a fitup, giving us an opportunity to deposit our weld with a minimum of penetration and still resulting in good fusion, the object being to keep to a minimum the influx of the high-carbon base materials in the weld deposit which would naturally result in a very brittle weld. On this, as well as other similar operations, we use a general-purpose mild steel rod of the E-6012 classification straight polarity. As will be noted, in the assembling of the frame in the fixture we try to avoid holding the work rigidly so as to give the work a chance to expand and contract at will during the welding operation. The side rails and ends are merely placed in the fixture without overlooking the important fact that the frame has to be dimensionally correct.

By using arc welding to fabricate our studio couch frames, crib bottoms, etc., we have been able to eliminate the corner braces as well as the rivets, resulting in a much more rigid frame as well as one that reduces cost.

In Fig. 7 is shown an elevator frame for hospital bed in its various positions. By using this simple arc-welding design, we eliminate the use of castings as well as riveting. These are just a few of some of our arc-welding operations done here at our plant on this type of material.

In Fig. 8 is shown a side member of an aircraft servicing stand being arc welded, the material all being 1010 mild steel tubing. The fixture is placed in a positioning rack to enable the operator to position his weld.

Figure 9 shows the fabrication of the end member of the same aircraft service stand being arc welded.

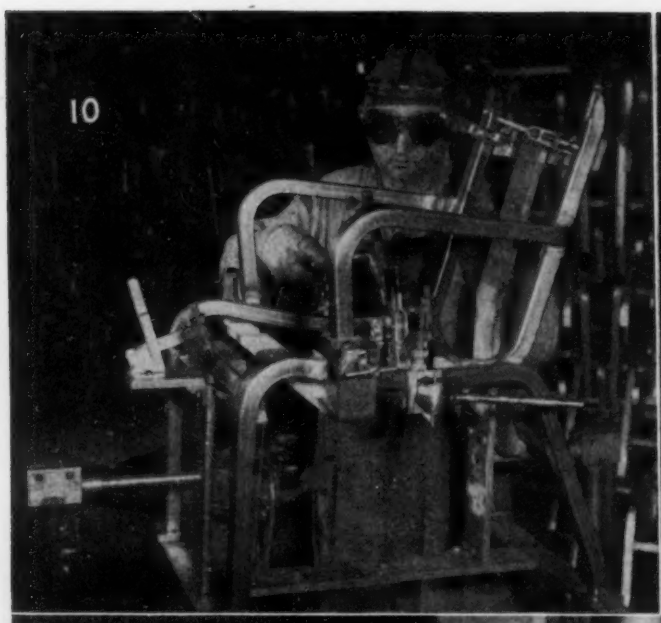
One of the most extensively used methods of Welding used here at our plant is the acetylene brazing method. At one time we found that one of our biggest problems lay in the flux removal prior to painting. In removing this flux, we found that the cost of removing the flux was greater than the brazing operation itself; however, it was necessary to remove this flux or residue which remained on the weld as it would prevent the paint from adhering to the metal at that point. We have been able to eliminate this phase of the brazing operation by using a liquid gas flux. In this process, the acetylene passes through the liquid flux so that the flux is actually in the flame. The presence of gas flux is determined by the green color of the flame. With the flux being in the flame, it has a tendency to flow ahead of the weld and clean the surface of the material, resulting in a fine strong smooth weld. We also find that we are now able to paint, spray or dip our finished merchandise without any flux removal whatever, thereby realizing a considerable saving in cost.

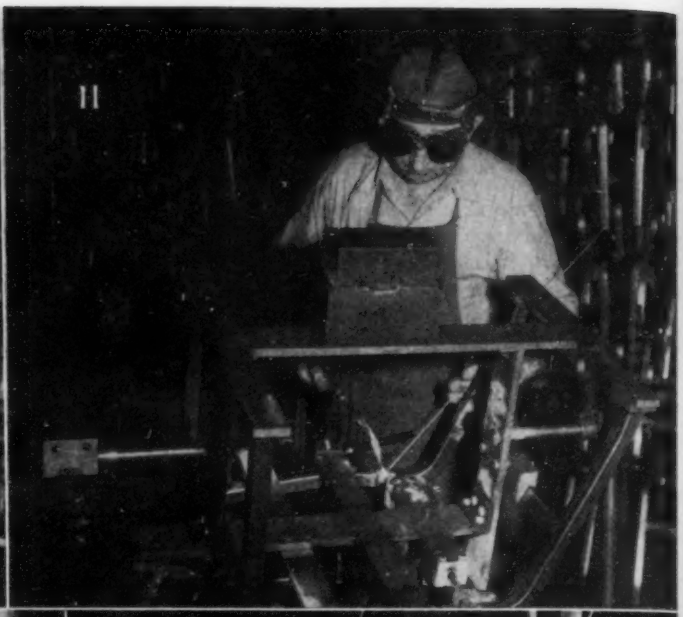
Figure 10 shows one of our chairs being acetylene brazed. In this operation we use a regular acetylene torch with a No. 3 tip. The rod used is a low fuming bronze rod of the following analysis:

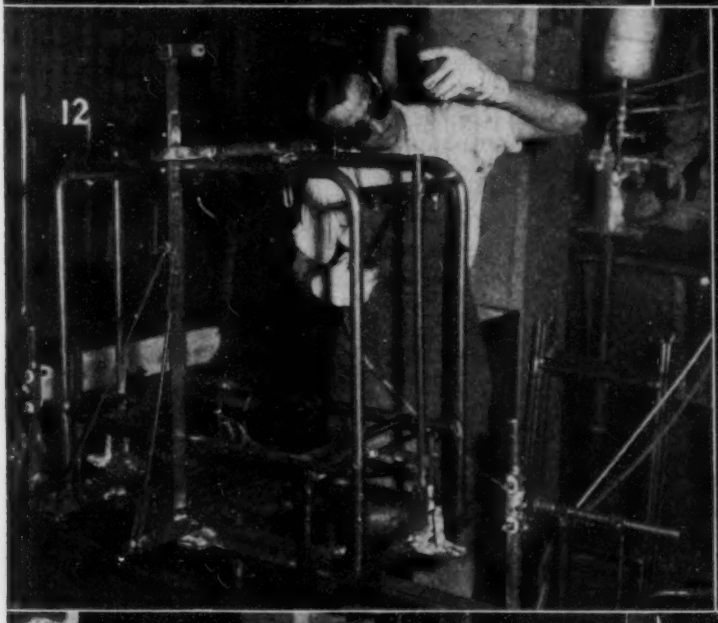
Copper	57.89
Zinc	40.22
Tin	0.86
Iron	0.89
Manganese	0.04
Silicon	0.10

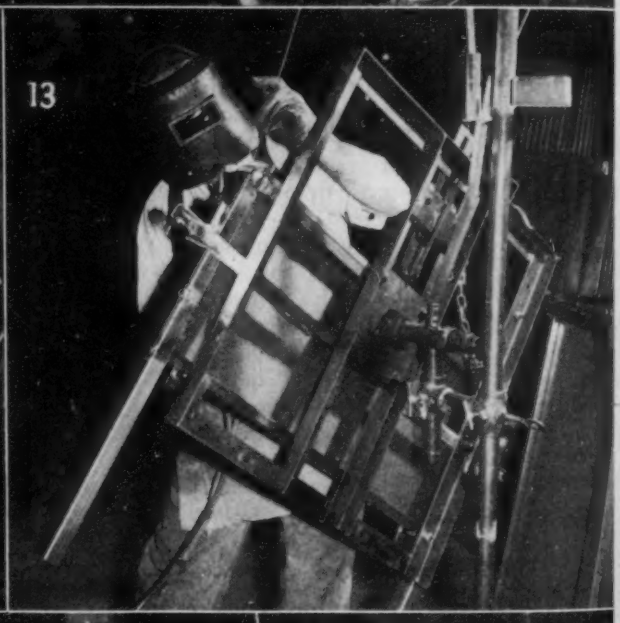
The entire chair is completely brazed in this fixture which has been counterbalanced and placed in a positioning rack enabling the operator to position his work at will as will be observed in Fig. 11.

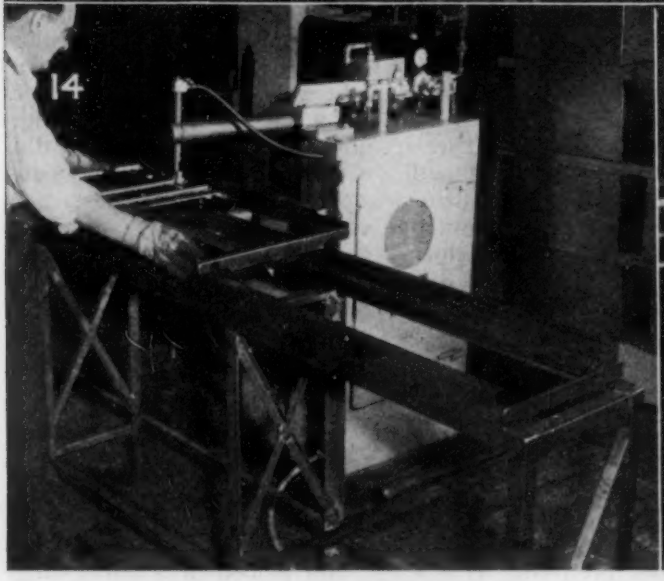
After the brazing operation, it is delivered to the degreaser and then to the paint department without any flux removal whatsoever.











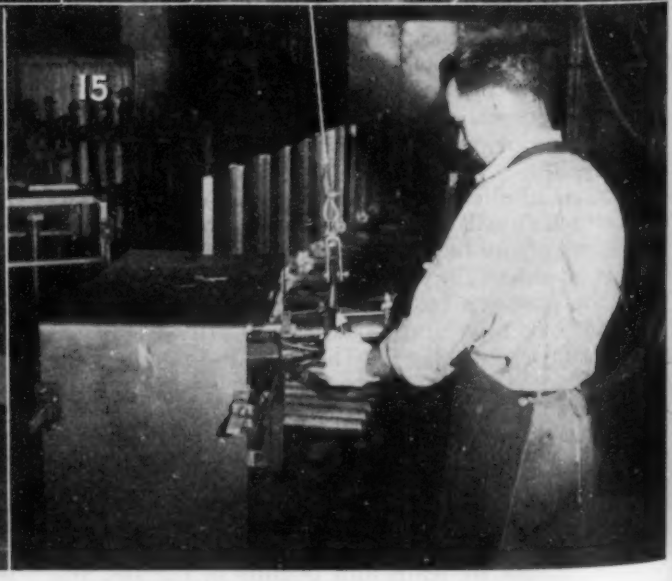
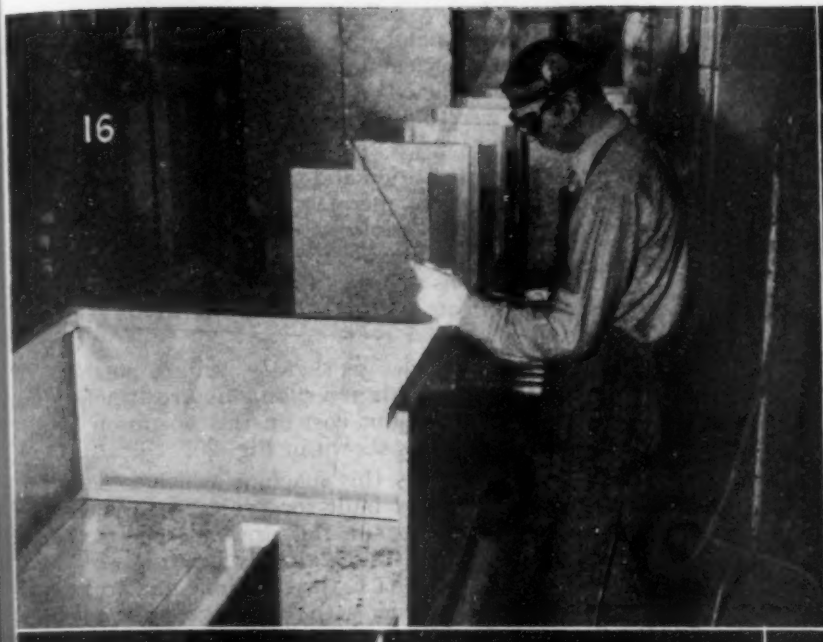
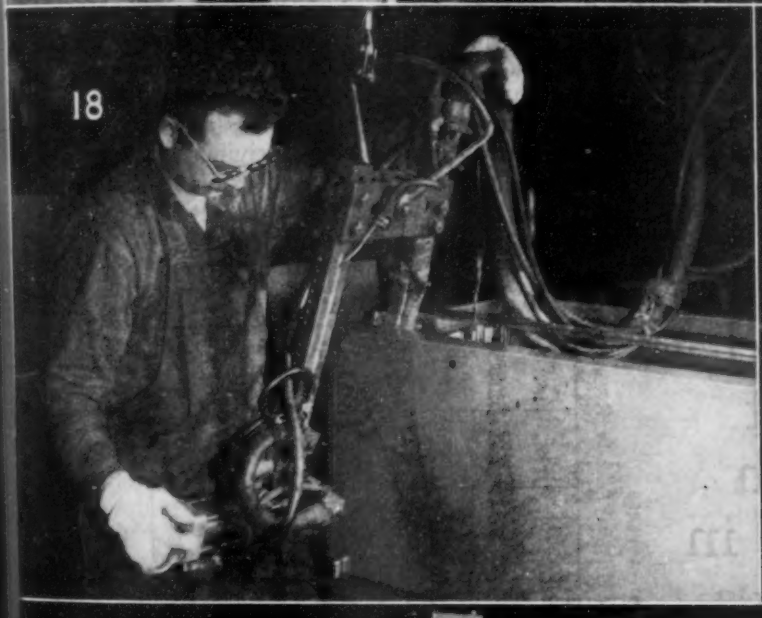
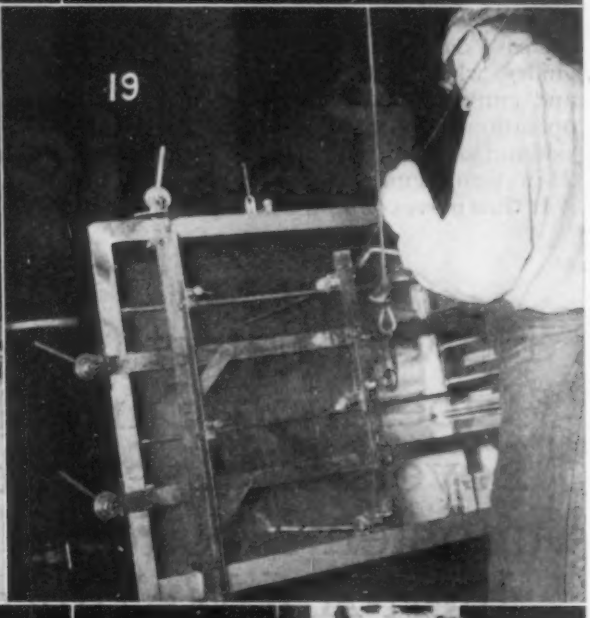


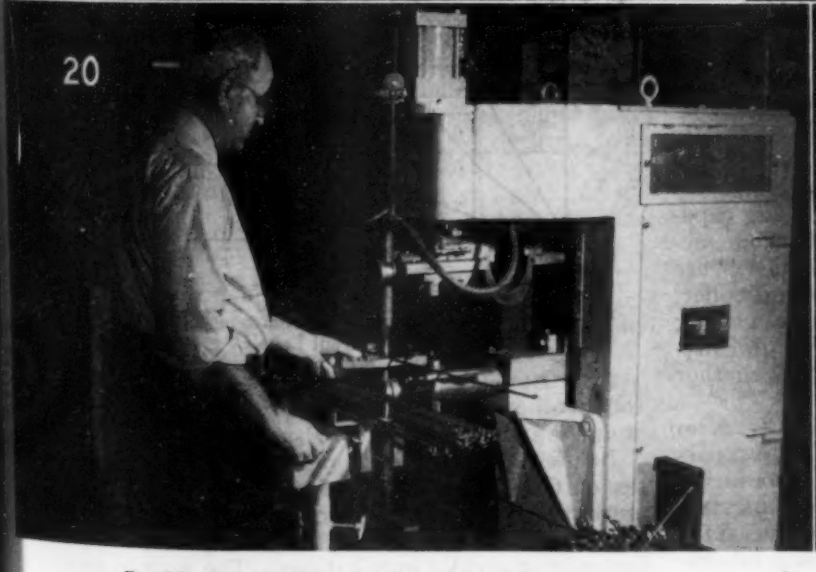
Fig. 10—Chair Being Brazed
Fig. 11—Brazing Fixtures Facilitate Work
Fig. 12—Brazing a Bassinette Rack

Fig. 13—Brazing Bed Panels
Fig. 14—Assemble Runner Guide for Dresser
Fig. 15—Spot Welding Corner of Dresser









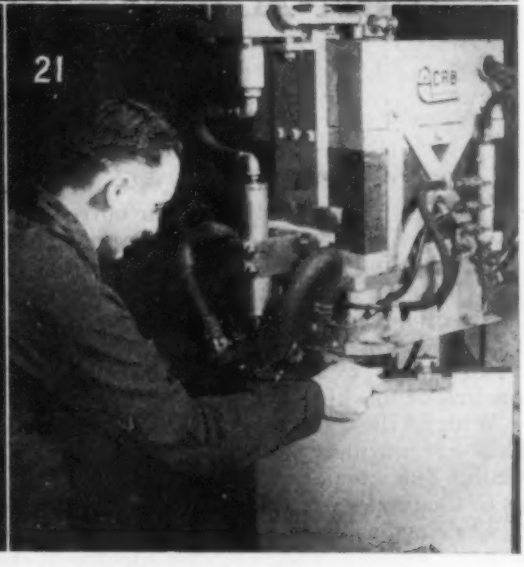


Fig. 16—Brazing Corner of Dresser
Fig. 17—Gun Welding Backs to the Case of Dresser
Fig. 18—Gun Welding Bottom of Case

Fig. 19—Placing Case in a Face Jig
Fig. 20—Spot Welding Trip Rods in a Sliding Fixture
Fig. 21—Projection Welding Corner Reinforcements in Dressers

Figure 12 shows another one of our brazing operations, in this case brazing a bassinette rack utilizing a simple positioning fixture.

Figure 13 shows bed panels being fabricated by brazing. These are just a few of the items that are fabricated by using the acetylene brazing methods.

In fabricating some of our metal steel furniture such as dressers, chests, night tables, etc., we utilize various methods of welding. I would like to take this opportunity to show you some of the welding operations that are used in fabricating our chest of drawers, dressers and desks.

First we assemble our runner-guide in this fixture which you will see in Fig. 14. Projections are formed in the runner-guide which are then projection welded to two side members which will resemble a ladder when completed. The top and sides of our dressers are made in one piece of 20-gage S.A.E. 1010 cold-rolled sheet steel. After the bending operation, it is placed in the fixture shown in Figure 15 where corner reinforcements are gun welded in the corner, using six spots per corner. It is then passed down a conveyer to the next operator, shown in Fig. 16, who brazes these corners. It continues along the conveyer, where the corners are disk-ground and on to another set of gun welders for gun welding the backs to the case shown in Fig. 17. The ladder guides or runner-guides, which were made previously, are then inserted and gun welded to the side of the case. In the next operation the operator inserts the deadening material and side supports and gun welds the bottom to the case using a 22-in. throat gun as shown in Fig. 18.

It then moves on to the next operation where the case is placed into what we call a Face Jig, as shown in Fig. 19, where the cross members, centerguides, as well as side supports, are acetylene-brazed in the case. The case is now ready to be fitted with drawers. At one time cases of this type were bolted together rather than brazed or gun welded.

In view of competition and the steadily increasing cost due to conditions in general, we are faced with the problem of constantly striving to make our operations as automatic as possible, regardless of whether they are welding operations or not. For example, until recently we used to fabricate a trip rod for baby cribs by acetylene brazing.

By changing the design slightly, we are now able to spot weld these trip rods in a sliding fixture attached to a spot welder reducing our cost on this operation by approximately 0.66% as shown in Fig. 20.

Another example is this machine which is shown in Fig. 21, designed and built for projection welding the corner reinforcements, in the dressers, chests, desks, night tables, etc., that have already been shown in previous illustrations. With this machine six projections are welded in each corner with one stroke of the machine. One operator is able to produce 40 units per hour compared to 22 units per hour by gun welding. This weld has given us flatter and stronger corners as well as increasing production and reducing costs.

As the old saying goes that necessity is the mother of invention, we are constantly striving to increase production and reduce costs as well as build quality furniture.

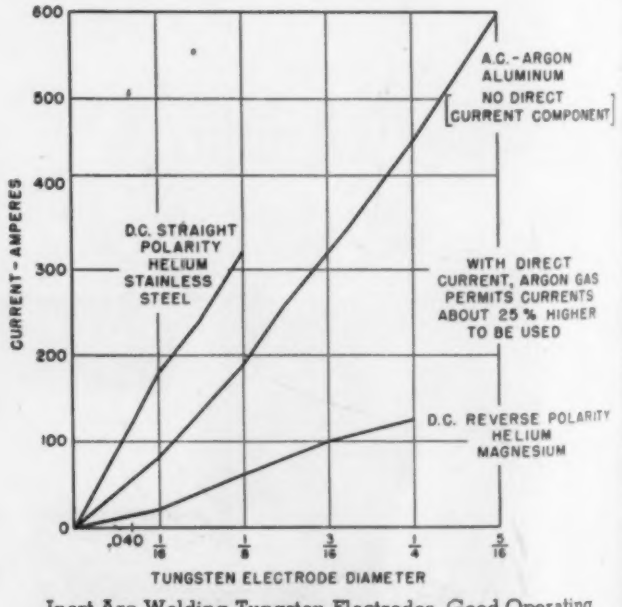
How to Select Good Operating Current Levels for Use with Tungsten Electrodes in Inert-Arc Welding

By R. W. Tuthill*

THE factors that affect the current carrying capacity of a particular size of tungsten electrode, according to General Electric Welding engineers, are the electrode extension from the gas nozzle and collet; water cooling, if used, and its distance from the electrode; type and flow of shielding gas; type of joint and material to be welded; and type of welding, whether manual or machine.

With all these factors to consider, and since there is no clear-cut maximum current that can be used with a particular diameter electrode, there is apt to be confusion as to the proper current to use on any diameter tungsten.

The chart shows current levels that have been used for manual welding in the General Electric Welding laboratory for several years, and gives current levels for each electrode size. These values are very flexible. Tungsten $^1/_{16}$ in. in diameter, for example, will operate satisfactorily on straight polarity d. c. with helium gas on stainless steel from 100 to 180 amp.



Inert-Arc Welding Tungsten Electrodes, Good Operating Current Levels

Below 100 amp. the arc may have a tendency to wander on the electrode tip and be a little wild. Above 180 amp., the electrode may become molten enough to drop off. This current, however, may be operated very satisfactorily in certain applications. The same is generally true of most other sizes of electrodes.

It is advisable to operate as nearly as the electrode current limit as is possible for each application, as this generally produces the most stable arc.

* A-C Welder Design Division, General Electric Co., Holyoke, Mass.

The Inspection and Testing of Brazed Joints with Especial Reference to Silver Alloy Brazing*

By J. L. Christie† and A. M. Setapen‡

Introduction

WHEN the AMERICAN WELDING SOCIETY's Committee on Brazing met on November 26, 1945, it was the concensus of the meeting that the Committee was not then prepared to formulate standard test procedures. The suggestion was made by G. O. Hoglund, of the Aluminum Co., that an article on testing would focus attention of interested people on the subject and would elicit valuable comments. R. H. Leach of Handy & Harman offered to look into the possibility of having someone in his organization prepare such an article. Although the present paper does not propose specific, quantitative, laboratory tests for the appraisal of brazed joints, it enumerates several tests that are frequently made as part of inspection programs.

Joint Requirements

There are several requirements that brazed joints must meet: They always must have strength of a greater or lesser degree, and they frequently, but not always, must prevent leakage of fluids. In addition, they sometimes must have high electrical or heat conductivity, especially good corrosion resistance, or other specific characteristics. Joints between turbine blades and their spacers, joints in band saws, in bicycle and motorcycle frames, in metal furniture, in primary structures in aircraft, and in some kinds of piping must have high strength. Joints in ornaments or decorative parts, in hollow knife handles, in kitchen utensils, and in many stamped metal parts when there is little stress or strain, need do little more than hold the components of the assembly together under normal wear and tear. Joints in piping, in oil and gas lines, in containers, in hydraulic equipment, in chemical engineering equipment, and in refrigeration must be leak tight. Joints in bus bars, in motors and generators, and in other electrical apparatus must have low electrical resistance. Joints in apparatus containing foods and various chemicals must have adequate resistance to the action of those substances. Joints in some articles, such as silverware, must be invisible even to close inspection. The heating involved in the brazing operation must not seriously alter the properties of the metals joined.

Types of Joints

Brazed joints may be either butt, scarf, lap or shear.

Hollow silverware, hollow knife handles, candlestick sleeves, frame corners, studs on nameplates, and various assemblies of stamped metal parts are items in which butt joints are used.

Joints in band saws and in hot-rolled copper and bronze rod for drawing into wire, and some longitudinal seams in large-sized brazed copper tubing are conventionally scarf joints.

By far the great majority of brazed joints are of the lap, shear, or sleeve type. Most joints in refrigerators, joints in structural assemblies, joints between pipe and fittings, joints between tubes and headers, and, in general, joints in which strength and leak tightness are required, are of the lap type.

Inspection and Testing Before Brazing

Design

The examination of a joint to be brazed should be made with the full knowledge of the function of the joint, and the inspection of the joint parts should ascertain whether or not the design is adequate. When high joint strength is a feature or when leak-tightness to liquids or gases is required, a lap joint with close clearance of parts to permit good capillary flow of brazing alloy is sought. It is good practice to have a lap equal to three times the thickness of the weakest member. With such design the part when subjected to test should fail in the members joined and not in the joint proper.

When only moderate strength of joint is required either a butt or lap joint can be employed and the analysis of joint design should be made accordingly.

A further consideration of joint design analysis should be the provision for alloy placement. Whether the brazing alloy is placed in a groove within the joint or resting on the member at the edge of the joint has a direct bearing on the visual inspection (discussed later) which is made after the joint is completed.

Clean Parts

Usually a visual examination is all that is required to determine if the parts are suitably clean for brazing. To insure satisfactory brazed joints, the parts must be free of oxide scale, grease, oil, dirt and any foreign material, and the proper inspection aids in the selection of the cleaning method and procedure to be employed.

Jigging

The inspection of jigs should disclose whether or not they function properly in maintaining proper alignment

* Presented at the Twenty-Seventh Annual Meeting, A.W.S., Atlantic City, N. J., week of Nov. 17, 1946.
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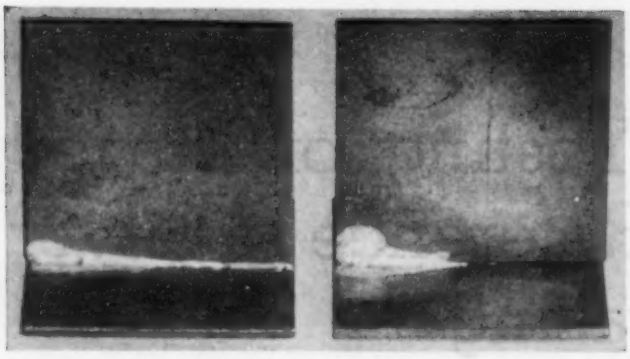


(A) (B)

Fig. 1

A. Good joint, solder applied at one end of joint and flowed the entire length of joint. B. Inadequate fluxing, solder flows only in fluxed area.

of parts and insure good clearances at the joint. While jigs should be of adequate size to hold the parts rigidly, they should be carefully examined to see that they do not draw heavily on the heat, thus preventing uniform heating of the parts.

Fluxing

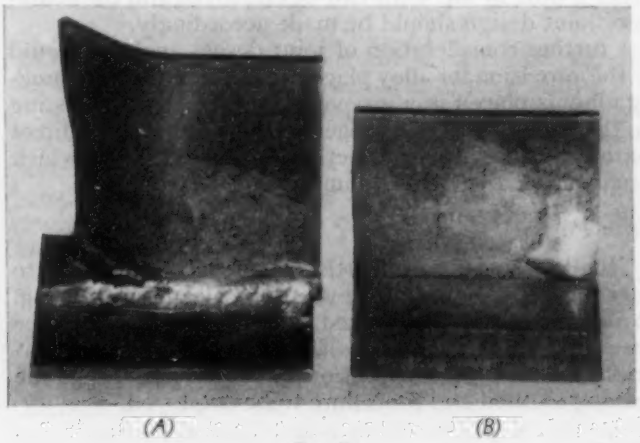
A properly fluxed part is one that has a uniform, continuous coating of flux on the surface, and if the inspection reveals bare spots, refluxing is indicated. On surfaces which are dirty, greasy or improperly cleaned, the flux when applied will have a tendency to draw away and ball up and, if this condition persists on reapplication of flux, the part should be recleaned. This is sometimes used as a method of inspection of cleanliness of parts. Since all parts to be properly wet by brazing alloy must have a continuous coating of flux on their surfaces, the inspection of the fluxing operation should be governed accordingly.

Preliminary Proof Tests

Before production is started, it is very advisable to test the adequacy of the joints by subjecting samples of a preliminary run to a more comprehensive series of tests than will finally be adopted. These tests may include all of those enumerated later. They should serve as a guide for the intepretation of the tests that will eventually be adopted.

Tests During Brazing

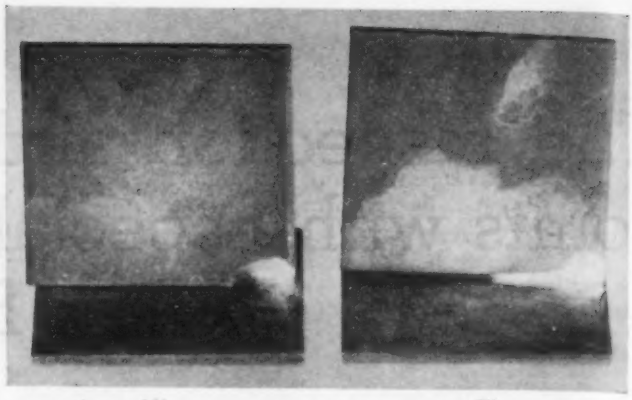
During the brazing operation, the inspector should make sure of the following:



(A) (B)

Fig. 2

A. Wrong alloy used, Sil-Fos makes poor bond in steel joint. B. Uneven heating, overheating of light member.



(A) (B)

Fig. 3

A. Localized heating, full joint not up to brazing temperature. B. Too much joint clearance.

That heating is uniform: that no part (particularly a light one) is overheated before another part (particularly a heavy one) is brought to the proper temperature; that, in automatic, multistation heating, the pieces in all stations reach the proper temperature; that, in furnace brazing, pieces in different parts of the furnace all reach the proper temperature.

That the torch does not blow away the flux or brazing alloy.

That in hand-fed jobs the alloy feed is uniform.

That the braze is not damaged by moving or otherwise straining the assembly while the alloy is solidifying and while the alloy or the components joined are so hot as to be weak.

Tests After Brazing

Routine inspection and testing can be performed best after the brazing operation has been completed.

The tests specified to be performed are those which experience has shown to give assurance of the dependability of the joint in subsequent service. The ideal test would, of course, be one that duplicates the service conditions exactly but the difficulty of applying such tests is self-evident, and so certain tests have therefore been evolved which give a reasonable assurance of satisfactory service (cf., *Inspection Handbook for Manual Metal Arc Welding*, Emergency Standard 1945, p. 62).

As in any testing program, the question of sampling arises. An excellent and detailed discussion of sampling is given in the A.W.S. *Inspection Handbook for Manual Metal Arc Welding*, Emergency Standard 1945, page 61.

Fig. 4—No Flux, Steel and Solder Oxidized

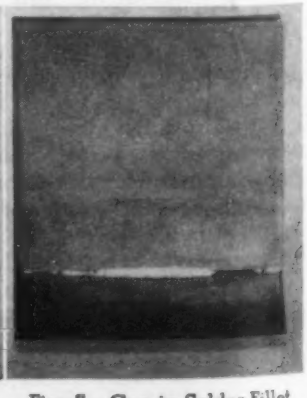


Fig. 5—Gap in Solder Fillet Due to Inadequate Fluxing

Obviously, whether every assembly will be inspected or only a percentage, and what tests will be performed on each sample, will depend on the joint requirements. Every brazed refrigerator evaporator assembly is carefully inspected and pressure tested; so also is every hydraulic aircraft landing gear assembly, and every gasoline tank. On the other hand, only a relatively small percentage of joints in brazed stamped parts such as oil can spouts, milking machine suction cups, paper cup holders, and joints in nameplate emblems are tested for strength.

The work must be cleaned and particularly the flux must be removed before any inspection or testing is performed.

Visual Examination

The simplest test that can be made is a visual one—the inspector looks at the assembly. He should make sure of some or all of the following:

That the alloy has flowed where it should; that it has flowed from the side where it was applied clear through to the opposite side; that it has flowed all around or along the joint leaving no gaps or voids; that where hidden inserts are used, the alloy has flowed to the outside; that it has wetted both members.

That the proper fillet, which often need not be at all large or pronounced, is obtained.

That proper alignment and dimensional accuracy have been achieved.

That there are no cracks either in the alloy or in the pieces jointed.

That flux has been removed.

That, in general, the assembly has a good appearance.

Mechanical Tests

Probably, the commonest mechanical test is one in which the inspector tries to break the joint apart by means of a hammer with or without the aid of other tools. A strong joint can frequently be torn apart by sawing through it, starting a tear with a cold chisel and finally hammering it apart. Butt joints and scarf joints can frequently be pulled apart in a tensile testing machine. Sleeve type joints can sometimes be pulled apart in shear. The object of all of these tests is to permit visual examination of the interior of the joint—observations of how completely the alloy has wetted the faying surfaces, how completely the space between the parts has been filled; whether or not flux has been entrapped, etc.

Another common and simple test is to bend or flatten the joined pieces to demonstrate that the joint will not fail even under such exaggerated abuse.

Brazed assemblies frequently have to meet some specific tensile or shear requirement. In such cases, quantitative tests are performed. Sometimes it is possible to hold the two parts joined in the grips of a tensile machine and make a simple tensile or compression test. Sometime a simple testing fixture is needed. In making tests on certain assemblies, one part is held in the grips in the lower head of the machine and the other is supported on a plate on the upper head of the machine. In these quantitative tests, pieces joined will usually break if the joint has been properly designed and made.

Hardness tests on the metals adjacent to the joint are often performed to make sure that the brazing operation has not unduly softened or otherwise damaged the metals joined; for instance, repaired tools.

Fatigue and elevated temperature creep tests have been made on certain definite brazed assemblies to ascertain the adequacy of brazed joints, but as a rule such tests are limited to the preliminary proof testing.

Pressure Tests

A very common test applied to brazed assemblies is the pressure test to detect leaks. The pressure test may be either hydrostatic or pneumatic. In the hydrostatic test, the article is held with the help of a gasket so that the article may be filled with water and the pres ure then increased. A defective piece will leak or even blow apart. In the pneumatic test, the article is similarly held, submerged in water, and the internal air pressure increased. A very small leak is revealed by air bubbles.

In the case of completely sealed articles such a float balls, the pressure test requires an opening (frequently necessary anyway to permit brazing) which subsequently must be closed either with a screwed-in plug or with a drop of soft solder. Subsequent immersion in hot water, followed by immersion in cold water, perhaps performed to observe the floating characteristics, will reveal any leak in the closure.

Sometimes in complicated assemblies containing more than one brazed joint certain tests are made after the first joints are made and certain other tests are made after subsequent joints are made. In this way, defects in the first joint can be repaired whereas perhaps the design is such that they could not be repaired after the subsequent joints are made. This is common practice in electric refrigerators.

Metallographic Examination

Examination of brazed joints by metallographic technique: sectioning, polishing, etching, and examination

Table 1

Defect	Cause	Inspection
Lack of flow	Improper clearance	Visual
	Improper cleaning	Pressure
	Improper fluxing	Destructive
	Insufficient heating	
Alloy flowing on one piece only	Wrong alloy	Visual
	Wrong flux	Pressure
	Unequal heating	Destructive
Pinholes	Improper cleaning	Visual
	Insufficient fluxing	Pressure
	Overheating	
Gaps in fillet	Uneven heating	Visual
	Insufficient fluxing	
Fillet porosity	Subsurface shrinkage	Destructive
		Filing, grinding, polishing
		Visual
Rough, crystalline fillet	Too high temperature	Visual
	Too long a time at temperature	
	Insufficient flux	
Flux inclusions	Too much flux in joints of large area	Destructive
	Insufficient alloy	
	Feeding alloy from both sides of joint	
	Lack of pressure	
	Trapping flux by alloy flow	
Excessive diffusion "Burning"	Too high temperature	Visual
	Too long a time at temperature	Metallographic
Cracking of alloy	Stress in joint before sufficiently cool	Visual (magnified)
		Pressure
Brittle Joints	Use of wrong alloy	Destructive
	Contamination of brazing alloy from coating on joint components	

under the metallurgical microscope are of great value particularly in revealing just what has taken place during brazing. Extent of diffusion of the alloy into the metals joined, changes in the structure of the metals joined, absence of wetting, presence of films, and microscopic soundness of the joint can be learned.

Joints that are rejected in visual or in pressure testing can frequently be repaired by rebrazing and the parts thereby salvaged. The rejected parts should be set aside and reprocessed accordingly.

Defects

Table 1 lists defects of greater or lesser frequency, states their causes and indicates what inspection or test can be expected to reveal them.

Lightweight All-Welded Steel Trailer for Transporting Heavy Construction Equipment

By C. W. Lytton*

A LIGHTWEIGHT, all-welded steel trailer, capable of hauling heavy construction equipment while being towed by an ordinary dump truck (Fig. 1), has been marketed by Rogers Brothers Corp., Albion, Pa.

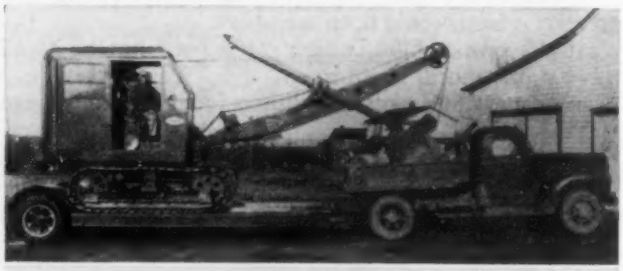
The unit, known as the "Tagalong Frontloader Trailer," has been produced to simplify the transporting of shovels, cranes, bulldozers and other capital equipment.

Welded construction is used in manufacturing the trailers to permit maximum joint rigidity while keeping over-all weight at a minimum, according to information received by The Lincoln Electric Co., Cleveland, who supply the welding equipment used in fabricating the trailer.

The trailer is utilized as follows: with the drawbar resting on the ground, the construction equipment is loaded from the front of the trailer (Fig. 2). The dump truck, which has first been equipped with special connecting apparatus consisting of a towing tongue, steel cable and pulleys, is then backed up until the rear end is over the front of the drawbar. The steel cable is pulled out slightly and looped around a pulley located at the end of the drawbar and another pulley which is a component of the connecting apparatus attached to the truck.

Then, as the dump body is elevated, the cable tightens around the pulleys and lifts the drawbar which forces the towing tongue into a slot. The safety coupling pin is inserted, the dump body lowered and the truck is ready to roll with the trailer and load "tagging along" behind.

Fig. 1—This Lightweight, All-Welded Steel Trailer, Easily Capable of Hauling a Heavy Steam Shovel, Is Being Towed by an Ordinary Dump Truck



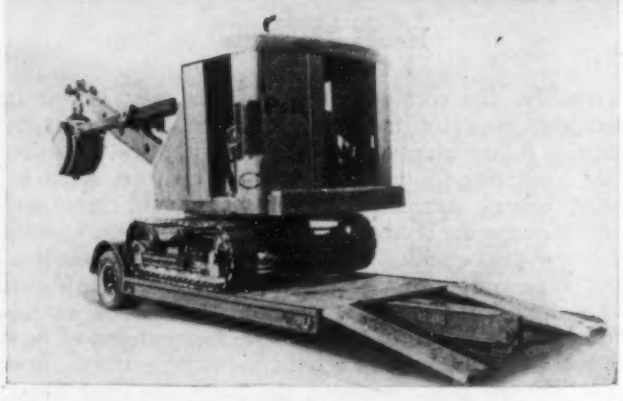


Fig. 2—With the Drawbar Resting on the Ground, the Shovel Is Loaded from the Front End of the Trailer

The sizes of the steel members used in constructing the trailers vary with the size of the trailer. Wide flange, low-alloy steel beams are used for the longitudinal members; light joists and mild steel channels are used for the cross members and fender wells are formed from 1/4-in. mild steel plate.

All of the members are positioned in a jig and tack welded together before the finish welding operations. Use of the positioner permits the turning of the work for down-hand, horizontal fillet welding with one pass of 1/4-in. electrodes of the A.W.S. Class E-6012.

Trailers are produced with load capacities of 10, 15 and 20 tons. All have a deck length of 14 ft. and a deck width of 8 ft.

* District Manager, The Lincoln Electric Co., Franklin, Pa.

The Metallographic Constituents of Steels and Cast Iron as Affecting Flame Hardening*

By O. M. Harrelson†

THE subject is a study of physical metallurgy—that phase of metallurgy which deals with the nature, microstructure, and physical and mechanical properties of metals and alloys.

For years metallurgists have used all means in developing a process for hardening steel and cast iron which would combine the simplicity and flexibility of heating-quenching method with the inherent advantages of differential hardening methods. Their investigations included the oxyacetylene flame as a heating medium, and, after considerable research, their efforts have culminated in the development of the process known as "Flame Surface Hardening"—a process that would produce the microstructure in a given material, needed for a given mechanical property.

Flame hardening may be defined as a process whereby the surface of a quench-hardening ferrous material is locally heated by means of an oxyacetylene flame to a definite temperature followed by a suitable cooling rate, thus to obtain certain physical properties which are associated with changes in the nature, form, size and distribution of microstructure. In other words, the surface of part to be hardened is rapidly heated to the required temperature and rapidly cooled, usually by a stream of water, or quenched in oil, water, etc. Before actually discussing the various phases of flame hardening, a brief review of the factors that control the hardenability of ferrous metals should prove helpful in a better understanding of the scope of the process.

There are three important things that affect hardening of steel or cast iron: (1) the kind and amount of alloy in the steel or iron, such as carbon, manganese, Cr, etc.; (2) for a given steel or iron the rate of heating to the austenite zone, temperature material is heated to, time it is held at said temperature and rate of cooling; (3) reaction rate. The important thing — to keep in mind—is the rate of reaction, e.g., austenite → ferrite and carbide, are the principal factors in determining the microstructure distribution; i.e., whether it will be fine or coarse dispersion of the two principal constituents of steel or iron, ferrite and carbide. This distribution is a large factor in the control of the properties of the material. If alloy elements are present in steel or iron the reaction rate will be retarded, the transformation will occur at a lower temperature, and the product formed will be harder. This means that addition of alloy element into austenite solid solution will decrease the rate of reaction so that greater undercooling may occur, thus bringing the austenite into a low-temperature range for transformation. The reaction at this point of undercooling is rapid and the product will consist of a fine dispersion of micro-constituents of higher hardness. With more and more rapid cooling this product, ferrite and carbide, becomes so fine they can no longer be separated by the highest magnification of the microscope. Beyond this rate of cooling a different reaction product is produced, namely, martensite.

Depth of hardening and its distribution for a given steel or cast iron is dependent upon the following conditions.

1. That all the carbon and alloy is in solution at the time of quenching.
2. That the critical cooling rate is reached or exceeded at time of quenching.
3. That no appreciable austenite is retained after the quench.
4. Number of microstructure present with one constituent of a pure metal or a solution of two metals in the solid state the properties are affected by:
   (*a*) The size of crystal. Small grain size means an increase of strength and resistance to shock and fatigue.
   (*b*) The shape of grain. A rounded grain indicates softness; whereas elongated crystals are associated with hard cold-rolled or drawn metal.

With two micro-constituents we have also to consider: the intrinsic properties of two phases; the relative volumes of each; the distribution of the phase, for example, globules or plates in the grains; films at grain boundaries.

For example, the structure of steel and white cast iron, consists of a mixture of almost pure iron called ferrite and a compound of iron and carbon called cementite. The cementite is hard but brittle, while ferrite is soft and weak. The cementite may be imbedded in ferrite in the form of globules which cause stiffening of the ferrite.

This reinforcement of the soft ferrite is far more effective when the cementite occurs as thin plates alternating with layers of iron, the continuity of the iron being interrupted. Maximum tensile strength is obtained when the structure consists entirely of such mixture at 0.85 C. Increase of the hard Fe_3C beyond the eutectoid point results into excess cementite at grain boundaries or of massive plates, such as in white cast iron. While such a volume increases hardness, the tensile strength is reduced.

The flame hardening may be divided into two classifications: hardening throughout and surface hardening. The physical properties produced in flame hardening material; depends upon the micro-constituents present,

* Presented at Twenty-Seventh Annual Meeting, A.W.S., Atlantic City, N. J., week of Nov. 17, 1946.

† Associate Professor of Mechanical Engineering, Georgia School of Technology, Atlanta, Ga.

before and after heat treatment, and the manner in which they are distributed.

Steel and cast iron contain various proportions of carbon, manganese, phosphorus, sulphur, silicon, and in some cases metallic alloying addition such as Ni, Cr, V, Mo, W, Cu, Al, Ti, Co, etc; together with iron. It should be understood that the elements do not exist in pure state in steel and iron, but exist in solutions and compounds depending upon the type of element. Therefore, an understanding of the elements and their influence should be studied. In this way we will be able to select the proper material for a definite purpose and its response to flame hardening. The effect of the alloying elements in the steel may be one or more of the following:

1. It may go into solution increasing its strength.
2. It may form hard carbide associated with Fe_3C.
3. It may influence the critical range in several of the following ways.
   (*a*) It may alter the critical temperature. For example, 4% Ni lowers the Ac transformation temperature some 86°F., increases the field in which the gamma phase is present, while 12% Cr raises the Ac, temperature to about 1432° F. and also forms a range of 302 to 392° F. above which the pearlite changes to austenite.

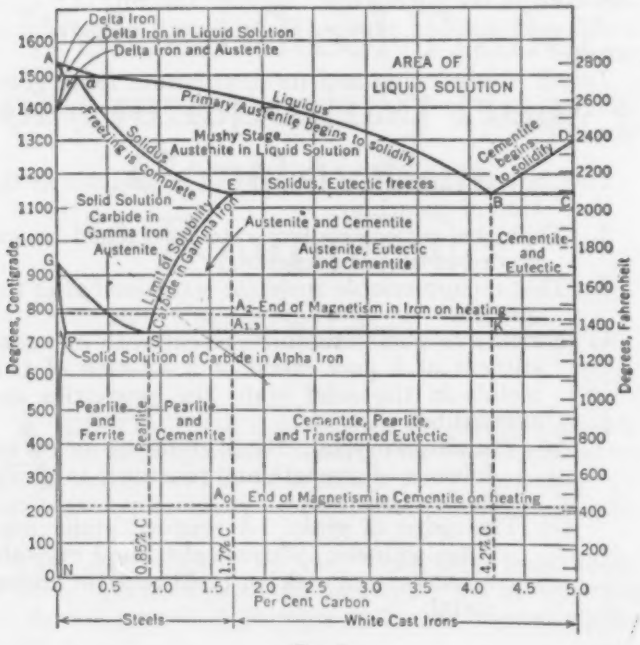


Fig. 1

   (*b*) It may alter the carbon content of the eutectoid, i.e., the carbon content of the pearlite in a 12% Cr steel is 0.33%, as compared to 0.87% carbon steel. Nickel also reduces the amount of carbon in pearlite at the expense of a greater volume of ferrite which is weaker.
   (*c*) It may alter "critical cooling" velocity which is the minimum cooling speed to produce martensite from austenite, i.e., it would require a 1022° F. drop per second to form martensite from austenite for a 0.42% carbon steel with an alloy of 0.55% Mn, while if the Mn is raised to 1.60% the cooling rate may be reduced to 122° F. per second. With chromium the effect is even greater. 2.5 Cr to 3% Cr, the cool speed to produce martensite from austenite is only 50° F. per second. Chromium and manganese, respectively, are far more effective than nickel.

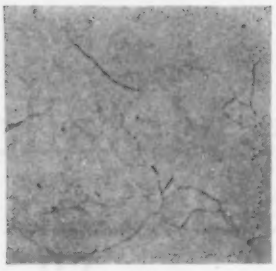


Fig. 2

4. It may produce effects characteristic of the alloying elements.
   (*a*) It may produce a sluggish thermal change, increasing the stability of the hardened condition, and so produce tool steels which are capable of being used to 1100° F., etc.
   (*b*) It may have a chemical effect on the impurities.

We may classify the alloying additions on the following bases:

1. Elements that form carbides: chromium, tungsten, titanium, vanadium, molybdenum and manganese.
2. Elements that graphitize in absence of group 1: silicon, cobalt, aluminum and nickel.
3. Elements that stabilize austenite: manganese, nickel, cobalt and copper. These elements raise A_4 and lower A_3 points, thus increasing the range in which austenite is stable, and retard the separation of carbides. These elements are more soluble in gamma than alpha iron.
4. Elements that stabilize ferrite: chromium, tungsten, molybdenum, vanadium, silicon and aluminum. These elements diminish the amount of carbon soluble in the austenite and thus increase the volume of free carbide in the steel for a given carbon content. They are more soluble in alpha iron than in gamma iron.
5. Elements that form in solution: Ni-Cu-Si-Al.

The physical properties and microstructure of steel and iron are dependent upon the type, amount and arrangements of their elements.

Steels consist of several microstructures, although the type of structure will depend upon the chemical elements

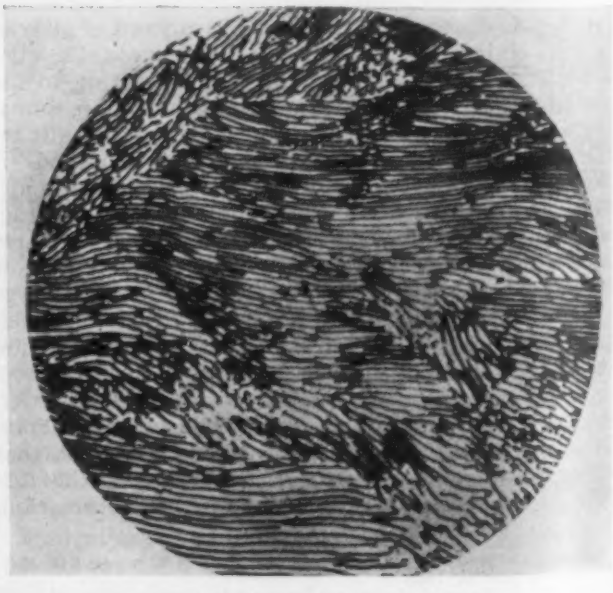


Fig. 3

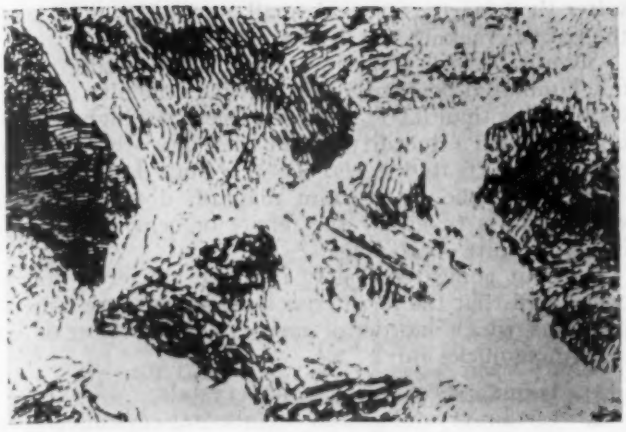


Fig. 4

present and treatment steel received. The chief microstructures are as follows: ferrite, pearlite, cementite, austenite, martensite, troostite and sorbite.

To the average laymen these names mean nothing, although if he knew what was happening to the metal while heating and quenching steels or cast iron, he would take advantage of proper knowledge of elementary metallurgy as applied to flame hardening.

By use of the iron carbon equilibrium diagram, we can best understand the microstructure changes that take place on heating and cooling (Fig. 1).

Appearance of Microstructures

Ferrite (Fig. 2).—Ferrite is a phase which is composed of iron together with a small amount of other elements in solid solution. Maximum carbon soluble at room temperature is 0.008%. It occurs in carbon steels with less than 0.85% C. It is white using vertical illumination.

Pearlite (Fig. 3).—Pearlite consists of two constituents, ferrite and cementite (13% Fe_3C and 87% Fe). At low magnification the structure is dark, at high magnification the structure consists of alternate layers.

Cementite (Fig. 4).—Cementite is a constituent which has a chemical composition of iron and carbon, having the formula Fe_3C. It is white if etched with 4% Nital; dark brown if etched with 5% sodium picric acid. It consists of 93.33% Fe and 6.67% C by weight.

Austenite (Fig. 5).—Austenite is a solid solution of finely divided particles of carbides and other elements in

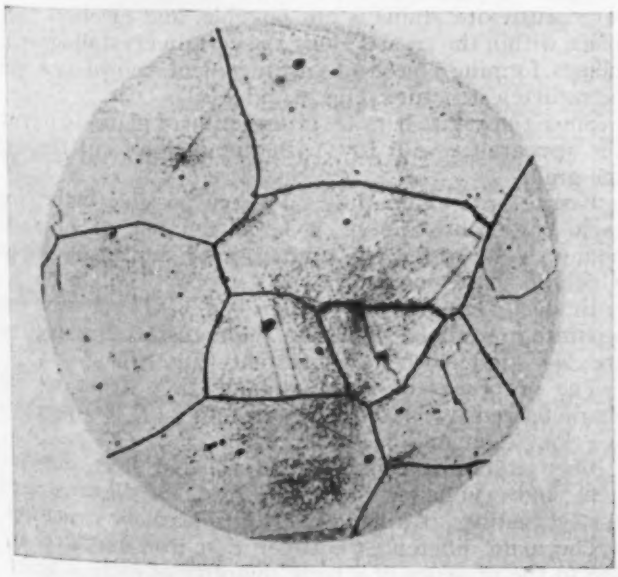


Fig. 5

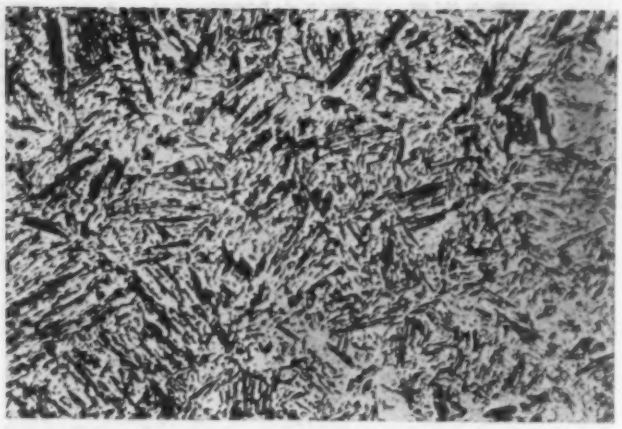


Fig. 6

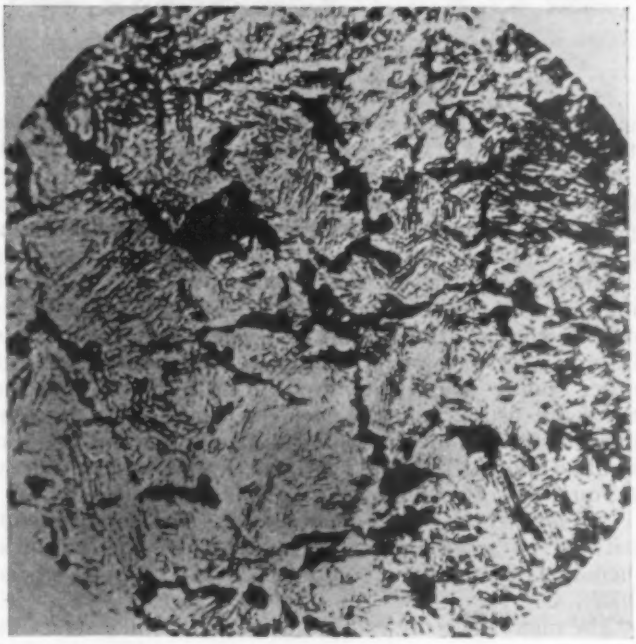


Fig. 7

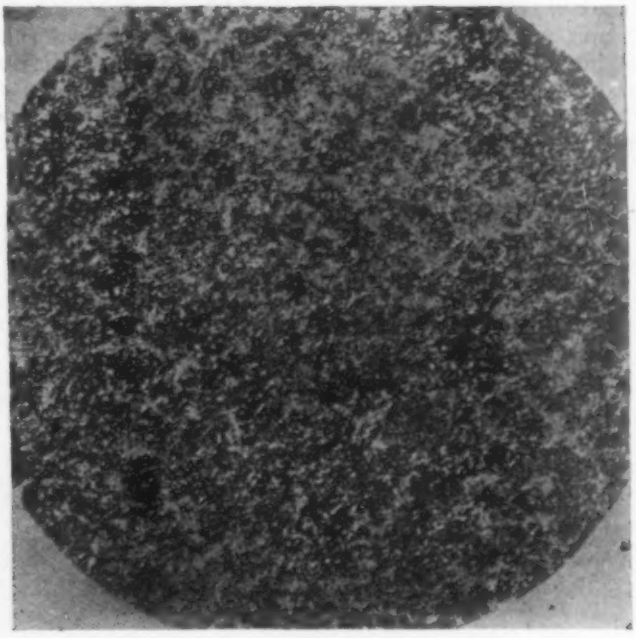


Fig. 8

Fig. 9

gamma iron. There is some doubt as to the condition of the carbon. All steel above the upper critical points are made up of austenite. The carbon content may vary from 0 to 1.7% C. It is not a constituent of a fixed composition. Although it is present in all steels above the upper critical points, very little of it is usually found in ordinary steel at room temperature, even after fast cooling. This is caused by rapidity with which austenite on cooling through the critical range, is transformed if not into an aggregate of ferrite and cementite, at least into other stages—martensite, troosite or sorbite. The last three are usually obtained by quenching. To prevent its transformation in carbon steel, the carbon content shall be above 1%, heated to 1850° F. followed by a drastic quench. It is white.

Martensite (Fig. 6).—Martensite is the hardest constituent obtained in a given steel, but the hardness increases with the carbon content of the steel up to 0.75% C.

The microstructure exhibits a fine needle-like structure which becomes more pronounced when steel is quenched from high temperatures.

Troostite (Fig. 7).—Troostite (nodular) rapidly etches black, and is practically unresolvable under low magnification. Special microscopic technique has shown that nodular troostite is a finely laminated mixture of ferrite and cementite, and therfore differs from pearlite only in degree of fineness and carbon content which is the same as that of austenite from which it formed. Troostite is softer than martensite, and small amounts in steel lessen the risk of cracking and distortion.

Fig. 9 (*A*)

Sorbitic Pearlite (Fig. 8).—A sorbitic structure is very fine laminated pearlite, resolved with difficulty and containing less than 0.90% C. It processes a high strength together with a ductility higher than any other constituents in heat-treated steels. It etches out dark.

However, the equilibrium diagram does not tell us what form is taken by the ferrite or cementite ejected from austenite on cooling.

Without going too deeply into the matter it may be considered that the ferrite has a choice of three different positions, which in order of degree of supercooling or ease of forming nuclei are:

1. boundaries of the austenite crystals;
2. certain crystal planes (octahedral crystallographic planes within the grains);
3. about inclusion.

Thus, ferrite starts to form at the grain boundaries, and if sufficient time is allowed for the diffusion phenomena all the ferrite is precipitated, while the pearlite occupies the center, forming a thick network structure.

Fig. 10

The size of austenite grains existing above A_3 pt. is thereby betrayed. If the rate of cooling is faster, the complete separation of the ferrite at the boundaries of large austenite grains is not possible, and ejection takes place within the crystal along the certain crystallographic planes, forming a mesh-like arrangement known as a widmenstätten structure (Figs. 9 and 9 (*a*)).

Since the ferrite bars are intersection of plates of ferrite, the appearance will vary with the angle of cut through the grain.

Ferrite is not deposited on every possible plane but each bar, consisting of a large number of adjacent planes, is separated by a number of similar planes on which no ferrite occurs.

In steel containing more than 0.90% C cementite can separate in a similar way, and Widmanstätten structures are also found in other alloy systems (Fig. 10).

The properties of the Widmanstätten structures are characterized by (1) low impact value, (2) low percentage elongation and (3) low strength.

This structure is found in overheated steel and cast steel, and insufficient quenching rate. If silicon is used in steel castings, it will modify it into feathery structures.

The main differences between cast iron and steel are due to the presence of a large quantity of carbon, generally 2–4% and frequently high silicon contents. This

carbon dissolves in the molten iron and crystallizes out on cooling as a compound of Fe_3C or as graphite. Thus it will be seen that while carbon in ordinary steel exists as cementite (Fe_3C) in cast iron it occurs in two forms: (1) stable form—graphite (Fig. 11); (2) unstable form—cementite, known as combined carbon (Fig. 12).

Graphite is black, soft and occupies a large bulk, hence counteracting shrinkage; Fe_3C is white, intensely hard, with a density of the same order as iron. On the relative amounts, shape, and the distribution of these two forms of carbon largely depends the general properties of the iron.

The factors mainly influencing the character of carbon are: (1) the rate of cooling; (2) the chemical composition; (3) the presence of nuclei of graphite and other substances.

A high rate of cooling tends to prevent the formation of graphite, hence maintains the iron in a hard unmachinable condition. This factor allows us to easily form harder cast iron.

The effect of chemical composition:

(*a*) Carbon lowers the melting point of metal and produces more graphite.

(*b*) Silicon dissolves in the iron as a silicide (FeSi) which slightly strengthens the ferrite. It also acts as a softener by increasing the tendency of the cementite to split up into graphite and ferrite.

Fig. 11

Having obtained the above information on ferrous steels and cast iron, we can readily understand the response of these metals to flame hardening.

Surface flame hardening operat.ons can and should be mechanically controlled to avoid stress concentration in critical areas, and to obtain proper distribution of microconstituents, to secure uniformity in hardness.

Hand operation, although occasionally desirable, does not secure uniform results without special care on the part of the operator.

There are usually many mechanical devices available in most shops to eliminate the necessity of building special equipment. A drill press or a lathe may easily be adapted to flame-hardening application. The torch is mounted on the tool carrier for smooth horizontal motion along the surface to be hardened. The parts to be hardened may be mounted on or alongside the lathe. If work needs to be rotated for hardening circular pieces a lathe or a drill press may be used by making a few simple jig attachments for securing parts and torch.

Where production operation of flame hardening is desired we would suggest a more elaborate and efficient equipment to be used than above-mentioned items for small shops.

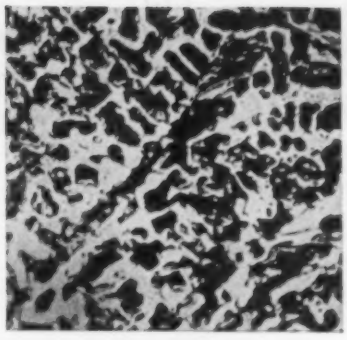


Fig. 12

The degree of success of flame hardening will depend on the following factors: chemical composition of material, rate of heat input volume, type of flame used, temperature heated to, time it remains at temperature heated above, upper critical point, rate at which it cools and control of stress distribution during process of heating and after quenching.

Flame hardening is flexible, allowing the use of a number of methods for producing desired results. It is possible and frequently necessary to use different procedures when hardening similar parts of different size. The process may be divided into four methods. These are: (1) stationary, (2) progressive, (3) spinning, (4) combination.

Stationary Method.—The application of the flame to the whole surface to be hardened and then quenched, a method termed spot hardening, and operation wherein the torch flame and work are motionless.

Example is the flame hardening of automobile fuel pump leaves rocker arms value stem ends, etc. The process is applicable to small or local areas, seldom more than 4 sq. in. in size or less.

Progressive Method.—The application refers to the process wherein the torch flame or a group of flames and work move with respect to each other. The flame is passed over the surface to be hardened at proper speed for suitable heating. The heated area is then quenched by a stream of water which moves with and immediately behind the flame at a point where it will produce proper quenching effect and not interfere with torch flame. The speed of flame travel is determined by operating variables such as flame intensity, type of material being treated, the temperature desired and depth of case desired It may vary from 4 to 10 in. per minute. Illustrative of this is the flame hardening of flat surfaces such as machine tool ways, scraper blades, rail ends, crane wheels, etc.

The Spinning Method.—The application of this process refers to those operations wherein the torch flame or a group of flames may be moved back and forth lengthwise along the work, as the object is spun between centers past the torch flame. If objects are small the movement of torch is not necessary. Therefore we may divide the process into two groups: spinning and progressive spinning. These processes are satisfactory for treating long cylindrical objects, such as shafts, pump rods, and hardening of gears, pinions, etc.

The time required for hardening by this method will vary from a few seconds to a minute, depending upon the diameter of the piece treated, the number of blowpipe and other factors.

The combination method is a combination of progressive and spinning method and is applied to circular objects of such lengths that the blowpipe may traverse while the part is being spun. Example—the flame hardening of shafts by spinning the shaft in a lathe while the blowpipe mounted on the tool rack traverses the shaft.

Arc Welding Used in Renovation of Railroad Equipment

By A. L. Champigny*

ARC welding plays an important part in the renovation of Diesel-electric locomotive equipment and railway cars at the shops of the International Railway Car and Equipment Manufacturing Co. of Kenton, Ohio.

Two 60-ton Alco-G-E Diesel-electric locomotives which had seen duty in Iran with the Army were recently overhauled, remodeled and streamlined for the Alaska Railroad in the International shops. This company is also rebuilding and streamlining railway cars formerly operated by the Bureau of Mines, for service on this same railroad.

The roof of each railway car is streamlined by welding panels of steel sheet over a framework of channel and bar stock. The panels are double butt welded along the entire length of the roof with fillet welds, using A.W.S-A.S.T.M Class E6012 electrodes, following completion of the center seam operation. The ends of the metal panels are welded to the body of the car with horizontal welds on each side of the car.

In observation cars, streamlining is accomplished in much the same manner, except that the rear ends of these cars are enclosed. A sheet steel skirting is added to enhance the streamlining effect. This is tack welded along the entire car.

Braces are tack welded to the underside of the skirting and body of the car for added reinforcement.

A series of all-welded cabooses for use by this railroad in extremely low temperatures over Alaska's most rugged terrain has recently been produced in the International shops. In this model, sheet steel side sections are lap welded in vertical down-hand welds. Side sheets are attached to the "Zee" bar superstructure by tack welding at strategic points. The end section of the cabooses consists of a welded fabrication similar to that used in welding the sides.

Another innovation developed by International Railway Car is an all-welded striker assembly for the caboose underframe. This striker replaces the standard casting, at a saving of approximately $11 per striker, or $22 per car set. This is done without sacrificing any of the strength or shock resistance demanded by American Association of Railroad standards. A weight reduction of about 25% is one of the outstanding features of this innovation.

* Apparatus News Bureau, General Electric Co., Schenectady, N. Y.

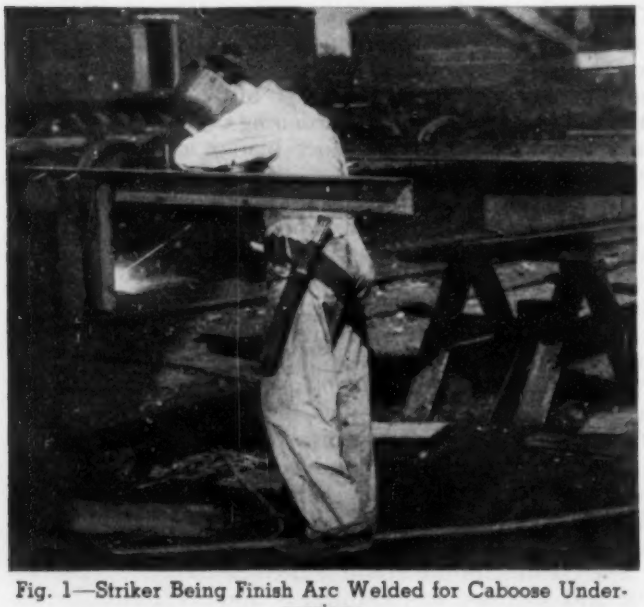


Fig. 1—Striker Being Finish Arc Welded for Caboose Undercarriage

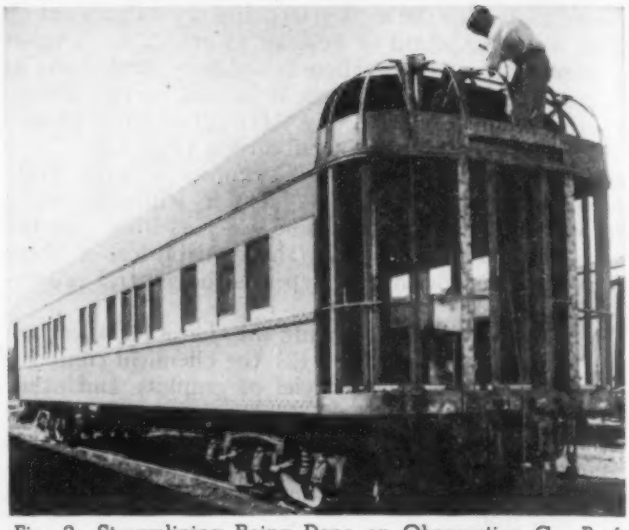


Fig. 2—Streamlining Being Done on Observation Car Roof Through Use of Arc Welding

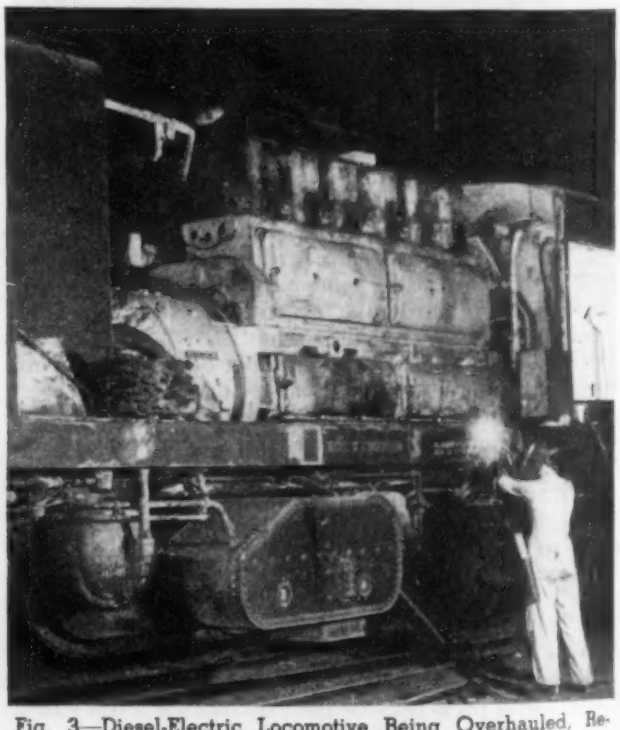


Fig. 3—Diesel-Electric Locomotive Being Overhauled, Remodeled and Streamlined

Lead Welding Practices

By L. S. Bowser*

OXYACETYLENE lead welding, or "lead burning" as it is often called, is not difficult, although a special technique is required because of the inherent properties of the metal. However, the difference in technique—hardly greater than that between steel and aluminum welding—can be readily mastered by following the suggestions given here.

Properties of Lead

In its commercial forms, lead may be generally classified as "soft" or "hard." There are a number of types in each class, but all can be successfully fusion welded with the oxyacetylene flame if the rod used is of the same composition as the lead being welded.

Grades known commercially as "corroding," "common," "chemical," "acid" and "copper" lead are of the "soft" variety. They are heavy and have a dull gray surface appearance, but show a bright metallic luster when freshly cut or scraped. These "soft" leads melt at about 620° F. and have so little mechanical strength that large pieces must be well supported to prevent them from collapsing under their own weight.

Lead alloys, containing from 1 to 10% of antimony, are generally known as "hard" leads. They melt at a lower temperature and are somewhat lighter and considerably harder than the "soft" leads. "Hard" leads are most frequently used where greater strength and better casting quality are required.

"Tellurium" lead (containing a small percentage of tellurium) is another alloy widely used in chemical construction. In unworked commercial forms, it is softer than the antimonial or "hard" leads, but work hardens in use.

Surface Preparation

The dull gray surface appearance of both types of lead is due to a film of oxides and other compounds that form whenever the metal is exposed to air. This coating has a melting point of about 1580° F.—more than double the temperature required to melt the metal underneath. Unless surface oxides are completely removed from the areas to be welded, neither thorough fusion nor adequate control is possible.

Special shaving tools are used for cleaning. The shaving tool has a sharp edge which scrapes away the dark oxide until a uniformly bright surface appears. Frequently new lead can be cleaned satisfactorily by wire brushing only. In every case, both the surfaces to be joined and the welding rod should be thoroughly cleaned immediately before welding begins. Because no flux is used, the success of every fusion weld in lead depends in large measure upon thorough preparation of the surfaces.

* The Linde Air Products Co., Boston, Mass.

Welding Rod

Flanged joints in sheet lead up to 1/8 in. thick are made without adding welding rod. Other operations in which no rod is used include overhead lap and flange welding, vertical lap welding of sheets up to 1/4 in. thick, and sometimes horizontal welding on vertical plates. For all other types of work a welding rod, of the same composition as the lead or lead alloy to be welded, should be used. Sheet lead cut into strips, or triangular bars (formed by melting lead into the vee of a short length of angle iron) are commonly used. Shops that do a large volume of lead welding frequently mold their own rod in a variety of diameters.

The welding rod should be somewhat thicker than the lead to be welded. For example, a 1/4-in. diameter rod should be used to weld sheet 1/8 in. thick. Recommended welding rod sizes to be used with various weights or thicknesses of lead sheet are given in Table 1.

Table 1—Lead Welding Data

Sheet Designation, Lb.	Sheet Thickness, In. Fraction	Sheet Thickness, In. Decimal	Recommended Welding Rod Diam., In.	Recommended Diam. of Welding Tip, Orifice Drill Size
1	1/64	0.016	1/32	79
2	1/32	0.031	1/16	74
4	1/16	0.063	1/8	70
8	1/8	0.125	1/4	70
12	3/16	0.187	1/4	70
16	1/4	0.250	3/8	70
32	1/2	0.500	3/8	65
48	3/4	0.750	1/2	56
60	15/16	0.938	5/8	56

Blowpipes

Oxyacetylene "lead-burning" blowpipes are very small in size as compared with those used for welding steel. Welding heads or tips supply only 1 1/2 to 10 cu. ft. each of oxygen and acetylene per hour, but this is ample for even the heaviest material because only about 5% as much heat is required to melt lead as to melt the same amount of steel.

Our company supplies blowpipes which are designed especially for lead welding. However, any oxyacetylene blowpipe suitable for sheet metal, aircraft or other light welding work will prove satisfactory if equipped with heads or tips of proper size. Refer again to Table 1 for a general guide to the selection of the proper blowpipe tip size for a designated weight of lead sheet.

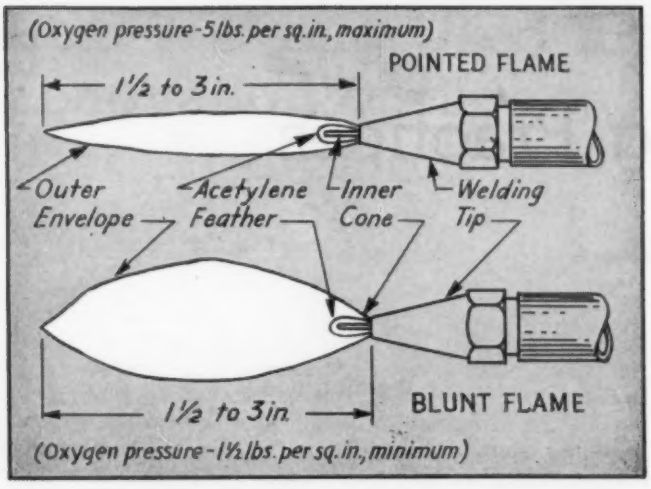


Fig. 1—A Pointed Flame Is Used to Insure Fusion at the Bottom of the Joint, and for Overhead Welding. In Multilayer Welds, All But the Root Layer Are Made with a Blunt Flame

Flame Adjustment and Technique

Best results are obtained with a tiny, low-oxygen-pressure ($1^1/_2$ to 5 psi.) flame $1^1/_2$ to 3 in. long. Some experienced operators use a neutral flame, but generally a flame containing a slight excess of acetylene (feather barely discernible) is recommended. With the latter flame, any slight increase in flow of oxygen during welding will tend to bring the adjustment toward neutral. With a finely adjusted neutral flame, the same slight fluctuation may be sufficient to cause oxidation of the metal. On the other hand, too great an excess of acetylene must be avoided in order to prevent a deposit of soot that will hamper welding.

A pointed flame, obtained by operating in the upper pressure range (not exceeding 5 psi.) is used to insure fusion at the bottom of lap and butt joints, and to hold the metal in place in overhead welding. For multilayer joints, all but the root pass is deposited with a blunt flame obtained by reducing pressure of the oxygen supply to the neighborhood of $1^1/_2$ psi. Correctly adjusted flames are shown in Fig. 1.

Manipulation of the blowpipe differs considerably from the technique used with any other metal. The flame is directed almost perpendicular to the work (Fig. 2), with the end of the inner cone close to the surface. The blowpipe is held steady until a small spot of lead just melts, fusing the two sheets together. Then it is lifted away quickly to prevent excessive melting. A second small puddle, overlapping the first, is melted in the same manner and the process is repeated to complete a joint with a series of overlapping, small welds.

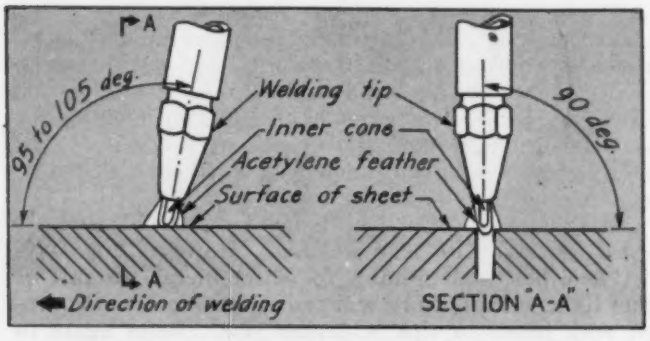


Fig. 2—The Flame Is Held Almost Perpendicular to the Work. The Tip of the Inner Cone Just Clears the Surface of the Sheet

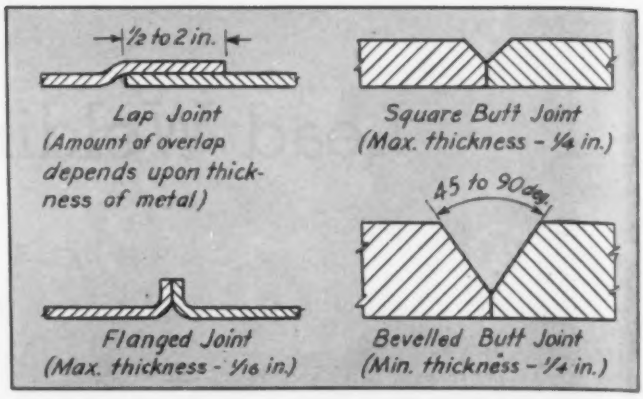

½ to 2 in.
Lap Joint
(Amount of overlap depends upon thickness of metal)
Square Butt Joint
(Max. thickness - ¼ in.)
45 to 90 deg.
Flanged Joint
(Max. thickness - 1/16 in.)
Bevelled Butt Joint
(Min. thickness - ¼ in.)

Fig. 3—These Four Types of Joints Are Used for Most Lead Welding Operations. Choice Depends Upon Thickness of the Metal to Be Joined

When metal from the rod is added, the shaved edges of the joint are fused before the rod is placed in the flame. The end of the rod is melted in the outer envelope of the flame so that a drop of metal is added just as the edges melt together. The rod is immediately withdrawn, and the flame is moved ahead to melt another section. When these edges have melted, another drop from the rod is added, and the same procedure is repeated so that the drops overlap to form a herringbone pattern. Any attempt to carry a large molten puddle is likely to result in excessive oxidation and melting a hole or losing the molten metal through the gap between the edges.

Welding Sheet Lead

Joints commonly used for lead welding are illustrated in Fig. 3. Sheet lead up to 4 lb. ($^1/_{16}$ in.) is normally welded with a flange-type joint. The upturned flanges are scraped bright, butted together and fused under the blowpipe flame without the addition of rod. Thicker sheet up to 16 lb. ($^1/_4$ in.) is cleaned, bevelled, butted together and tacked at 1-ft. intervals before welding. It is good practice to bevel all sheet lead above $^1/_{16}$ in. thick. The nose at the butt, however, never exceeds a maximum of $^1/_8$ in. Rod is used, but the fit must be good in order to fill the gap quickly and with a minimum of difficulty. Light tapping with a wooden mallet is helpful in aligning the sheets.

Lead over 16 lb. ($^1/_4$ in.) is bevelled before welding with a 50 to 90° included angle between butted surfaces. From 3 to 5 layers may be added from the welding rod in completing a bevelled butt joint in 24-lb. ($^3/_8$-in. thick) lead. Backing strips are not used, and all weld layers are deposited in the same direction.

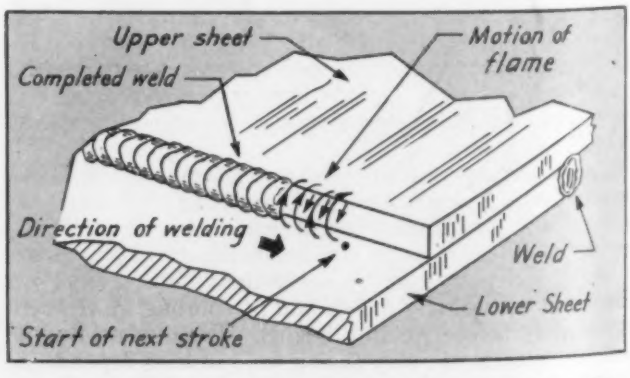


Fig. 4—Lap Welding Is Done in the Flat Position by Moving the Flame in a Series of Short Arcs Toward the Overlap and Then Straight Away. Rod Is Added a Drop at a Time

Lap joints are commonly used for tank linings and similar items fabricated from sheet lead. When the sheets are to be joined together before installation, they are supported by jigs or special forms. The amount of edge overlap ($^1/_2$ to 2-in.) depends upon thickness of the metal. After the exposed edges and overlapping surfaces of both sheets are scraped clean, the joint is tapped with a wooden mallet to bring the sheets into close contact. The mallet may also be used to offset one of the sheets, thus producing a flush appearance on one side.

Fig. 5—A Partially Completed Lap Weld in Vertical Sheet, Showing How Lead from Top Sheet Is Melted Down to Form the Weld

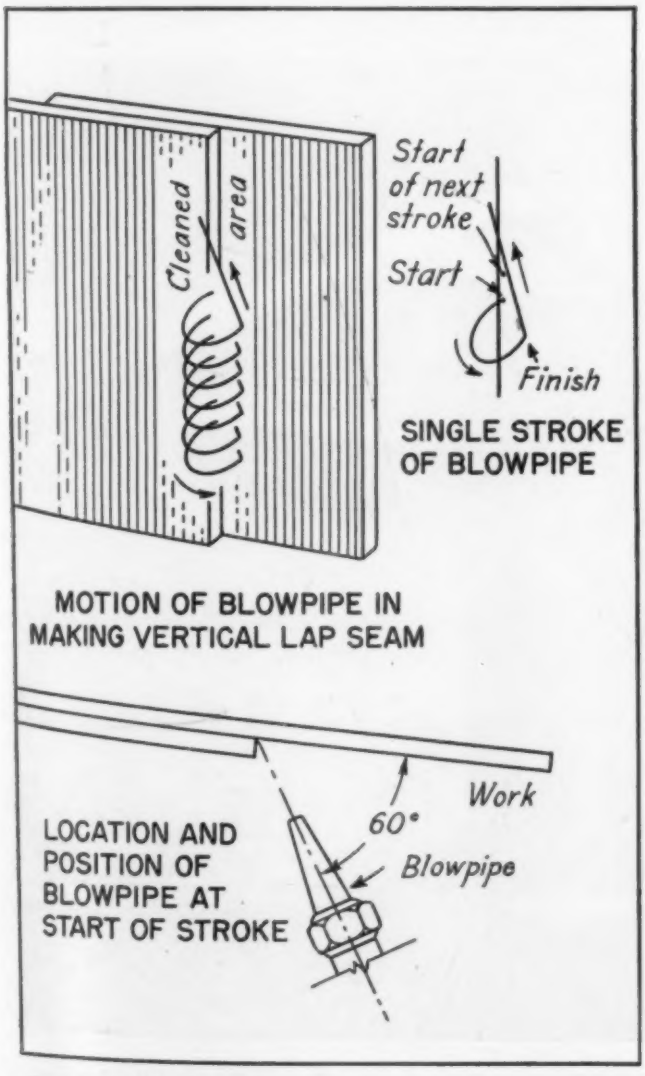


Fig. 6—When a Vertical Lap Weld Is Made Without Rod, the Flame Is Directed in a Series of Small, Overlapping Circles from Underneath Sheet to Lapped Edge and Back

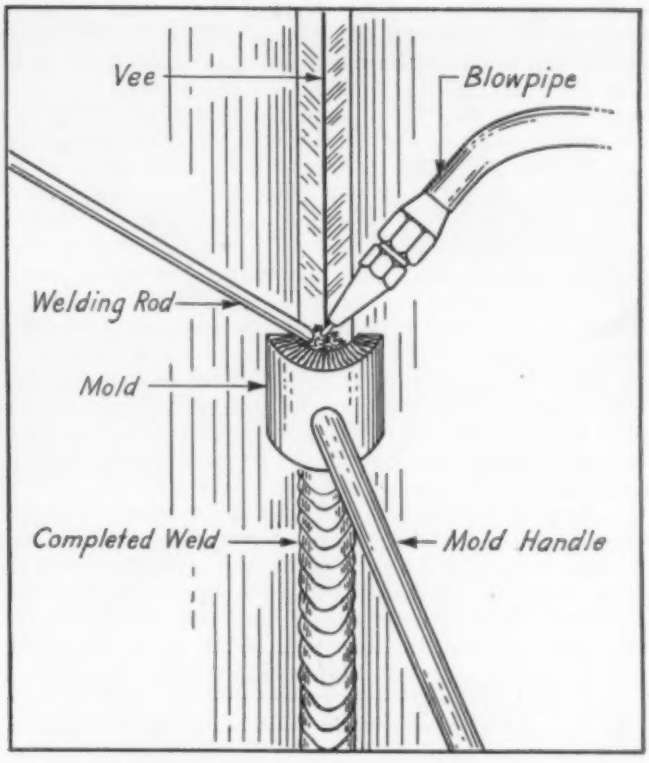


Fig. 7—An Iron Mold Will Facilitate Vertical Butt Welding. In Use, the Mold Is Held in Position Against the Joint with the Groove Aligned Over the Vee

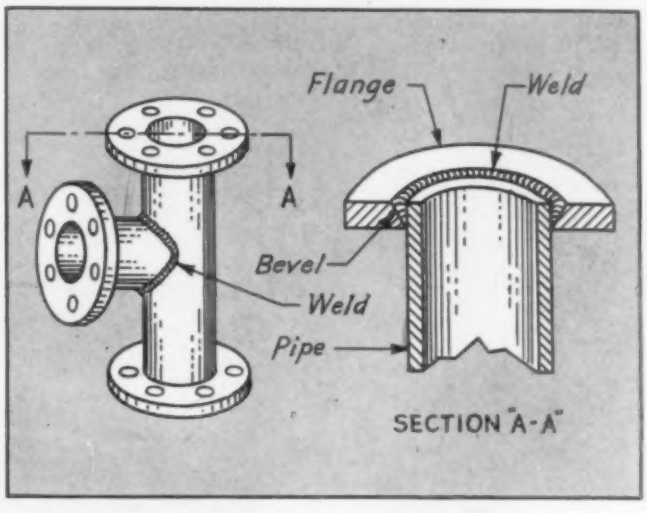


Fig. 8—Special Fittings Are Easily Fabricated by Welding. Flanges, Bevelled on the Inside Diameter, Are Cut to Slip Over the Outside of the Pipe

Each edge of the lap is then welded by moving the flame in a series of arcs toward the overlap and then straight away (Fig. 4). Rod is added a drop at a time as previously described. For 8-lb. ($^1/_8$-in.) sheet, melting extends about $^1/_4$ in. into the edge of the upper sheet and about $^3/_8$ in. into the lower member. Five weld layers are normally required for 32-lb. ($^1/_2$-in.) plate.

Vertical Welding

Vertical seams are welded upward from the bottom of the joint (Fig. 5). If the lower end of the weld does not rest on another lead plate, an iron rod is used to support the first drop of molten weld metal. When this hardens, it supports the next overlapping drop fused in the joint, and the process is repeated.

Welding rod is used for vertical butt welds in metal over 1/4 in. thick, but 16-lb. and thinner material is readily lap welded in a vertical position without the addition of rod. The overlap in such joints is from 1 to 3 in. depending on the thickness of the metal. In all cases, the entire areas of both overlapping surfaces are thoroughly cleaned. The overlapping edge is melted down to supply weld metal that gives a rounded finish to the joint.

As shown in Fig. 6, blowpipe manipulation is slightly modified. A circular motion of the flame is used, first to melt the underneath sheet, and then to melt and fuse a small amount of the overlapped sheet with it. The flame is then moved higher to repeat the process as the first puddle solidifies. The weld is thus carried to the top of the joint as a succession of flat disks of weld metal. When melting takes place more rapidly on one side of the joint than on the other, blowpipe movement is modified to carry the flame from the cooler to the hotter side of the joint.

A vertical butt weld, in lead thicker than 1/4 in., is easier to make with the aid of an iron mold. This type of mold is usually 2 to 3 in. long and semicylindrical in shape, with the center of the flat side grooved lengthwise. Diameter of the groove should be about 1/8 in. greater than the width of the open side of the vee between the butted plates. In use, the mold is held in position against the joint with the groove aligned over the vee (Fig. 7). Bevelled edges and welding rod are melted and fused together until the mold is filled. Care is taken, however, to see that the lead in the bottom portion of the mold is in a molten state before more lead is added, otherwise a defective joint will result. The mold is then lifted away from the solidified weld and raised in position for making the next section of the joint.

Overhead Welding

Lead welding in the overhead position is restricted to joining flanged and overlapped sheets. Considerably more skill is required than for flat or vertical welding, since the operator must remove the flame at the instant the metal becomes molten so that it will chill and solidify before it can fall away.

The tiny, pointed flame previously described is used for all overhead work. Welding technique is somewhat similar to that for making a lap weld in the flat position, but no rod is used. As the flame is moved from the overlapping edge to the sheet behind it, the pressure of the flame carries along a small amount of molten metal from the edge so that it fuses with the molten metal on the surface of the other sheet. When the overhead flange weld is made, the two edges are melted and fused with the same technique as for a flanged joint in the flat position.

Welding Lead Pipe

Welded lead piping systems are fabricated by following

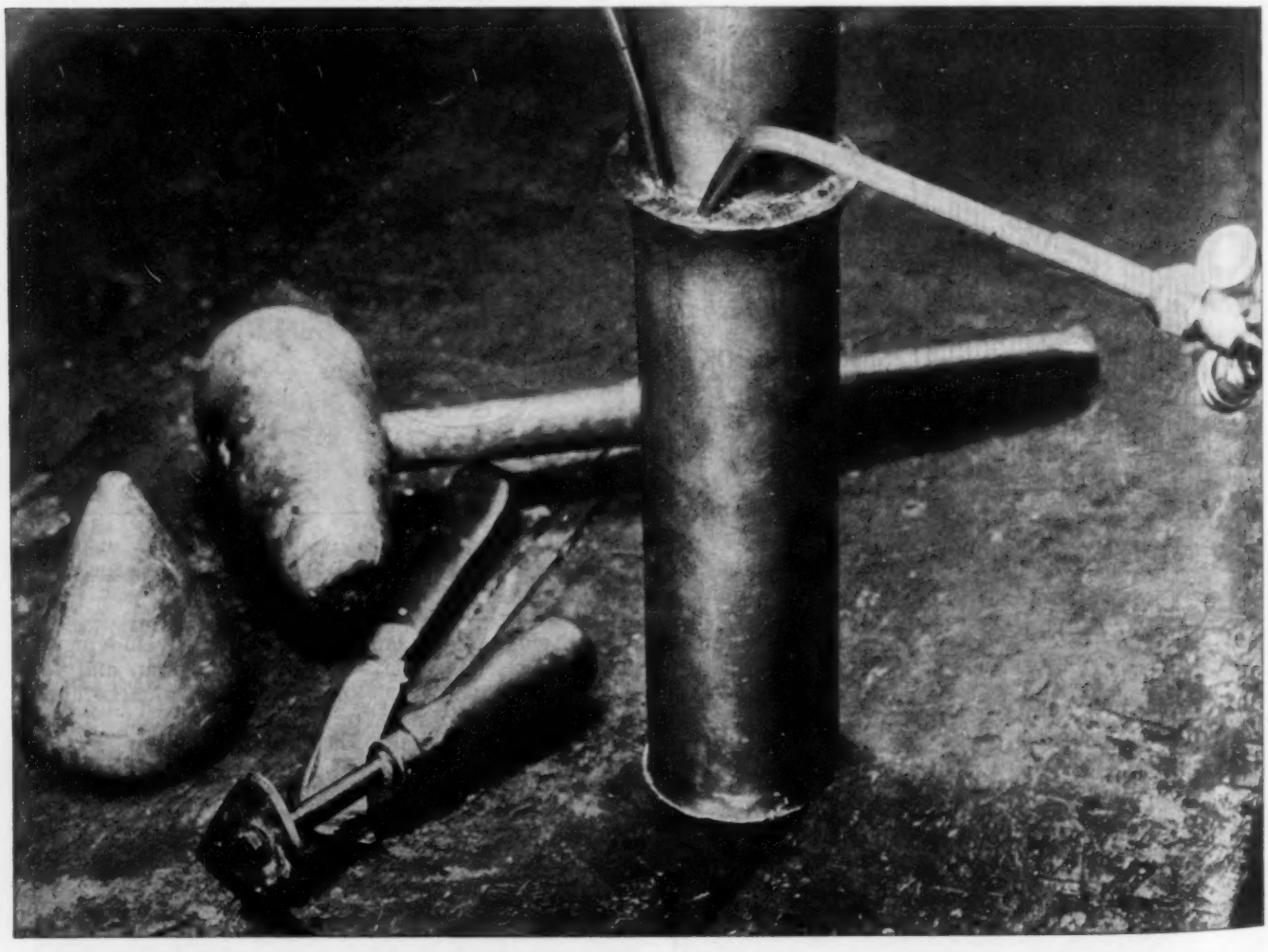


Fig. 9—The Cup-Type Joint Is Widely Used in Vertical Pipe Sections Because the Flared Edge of the Lower Section Provides a Flat or Pocketed Surface on Which to Work. Welding Technique Is the Same as for Making a Horizontal Lap Weld in Vertical Plate. Forming and Cleaning Tools Are Shown on the Bench

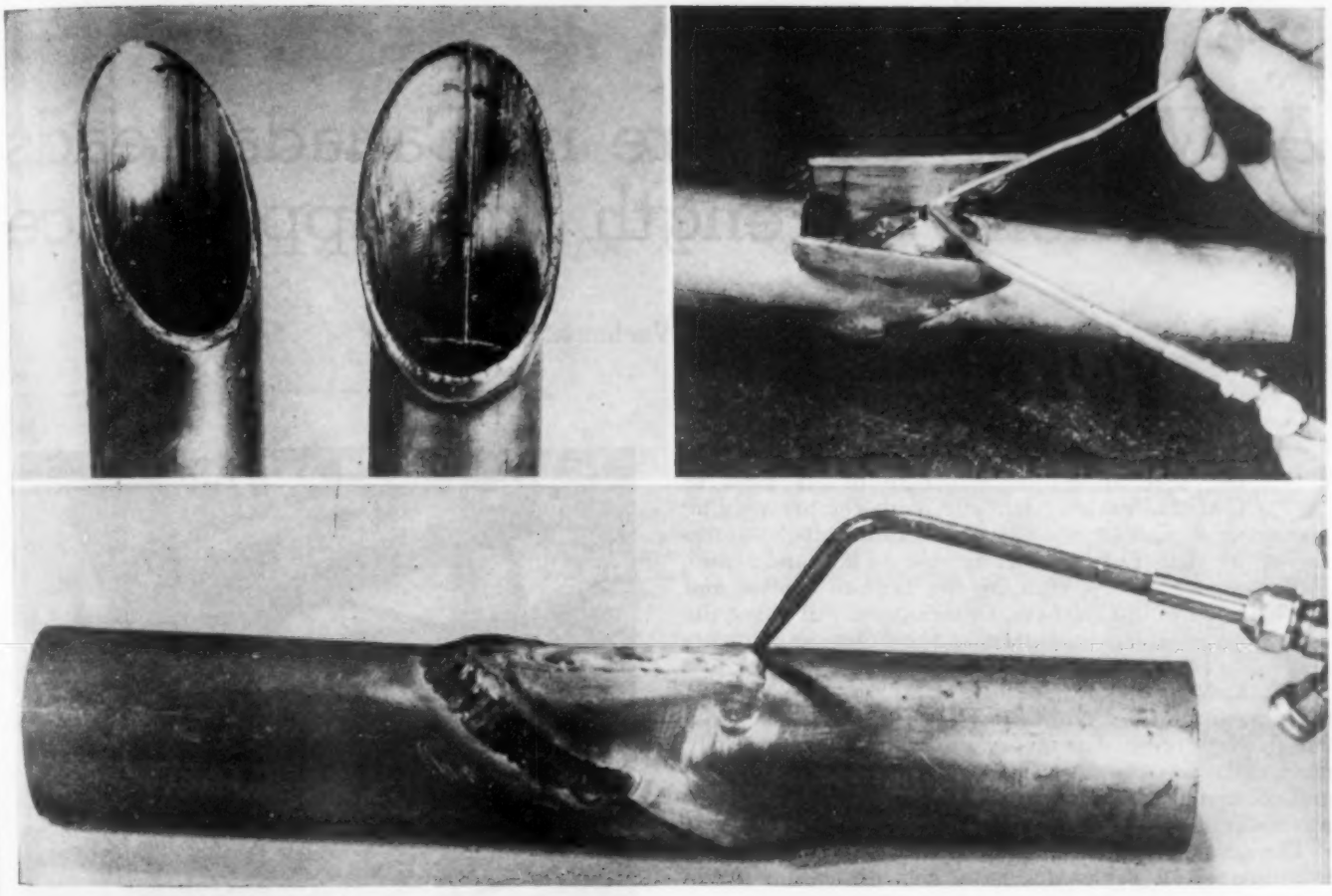


Fig. 10—The Split Lap Joint Is Used to Avoid Overhead Welding in Position. The Pipe Is Prepared by Cutting at an Angle, Then Flaring and Tee-Slotting the Female End. After the Ends Have Been Fitted, the Upper Section Is Bent Outward and the Weld Is Started at the Bottom. When the Inside Weld Has Been Completed, the Flaps Are Bent Back and the Upper Section of the Joint Is Completed from the Outside

the same general methods of layout used for piping systems of welded steel. Standard lead pipe and fittings are obtainable in a variety of sizes and weights. Special fittings for almost any condition can be made by cutting sheet to size, shaping ("bossing" or "dressing") it on wood or metal forms, and then welding the longitudinal seams. Holes for branch connections are usually melted through the pipe wall with the blowpipe flame. Melted edges are then properly shaped and scraped clean before welding. Because the metal is soft, fitting is easy.

Flanged joints are extensively used. Many chemical and paper plants make their own flanges. Such flanges may be cut from lead sheet to slip over the outside of the pipe. A bevel on the inside edge of the ring (Fig. 8) makes it easy to weld it to the end of the pipe.

The butt type weld is most suitable for any joint that can be rolled horizontally during welding. Edges are bevelled and cleaned the same as for heavy sheet. The pipe is rotated so that all welding can be done in the flat position. Like heavy sheet, relatively thick pipe is welded in a number of passes. With pipe, however, experienced operators find it possible to maintain the rod in the puddle at all times, using a technique very similar to that for welding steel pipe. Operators with limited experience obtain best results by the slower method of adding the molten rod metal a drop at a time, as described for butt welding plate in the flat position.

When the pipe cannot be rotated during welding, abutting surfaces are sometimes flanged in the same manner as the lead sheet illustrated in Fig. 3. Welding is then handled in the same fashion as the flange weld.

For vertical pipe, the cup joint (Fig. 9) is simplest to weld because the edge of the lower section provides a flat or pocketed surface on which to work. Overlap for such joints should be at least three times the thickness of the pipe wall. The surfaces should be clean. Welding technique is the same as that used for a horizontal lap weld in vertical plate.

To avoid overhead welding in position, the split lap joint (Fig. 10) is sometimes used. The two edges to be joined are cut at an angle and cleaned. The female end is then flared and tee slotted. After the pipe has been fitted together, the edges are bent out and the weld is started at the bottom on the inside and continued up the sides as shown. When the bottom half of the joint has been made, the flaps are bent back into their original position, welded in place and the upper half of the joint is completed from the outside. In this way, the entire weld is made in the convenient flat position.

Safety Precautions

Because fumes generated during lead welding may be toxic if inhaled in high concentrations or for long periods of time, lead welding operations should be conducted in well-ventilated locations. For bench work in an open shop, general ventilation such as an exhaust fan will usually be sufficient. Men working in an open tank should be provided with a positive air supply by a fan or blower directed into the enclosure. When work must be done in a confined space, such as a closed tank or pressure vessel, each man should be required to wear an air-supplied respirator or mask.

All-Welded Structure in Canada Leads in Economy, Strength and Appearance

By M. N. Vuchnich*

COMPLETION details on what is believed to be the first all-welded structure of its kind in Canada—entirely fabricated by the arc-welding process and without the use of erection bolts—was received by The Lincoln Electric Co., Cleveland, Ohio.

This structure was built by the Leeson Tractor and Implement Co: in Chatham, Ontario, and will house the new shops for the manufacture of their farm implements and equipment.

The building has dimensions of 200 ft. 8 in. by 151 ft. 4 in., and is built in four bays (see Fig. 1). The truss design is not original as these have been made previously in Canada, but the arc welding of trusses to the beams and columns is a departure from previously conventional methods in Canadian design.

The Leeson Tractor and Implement Co. was influenced to utilize the all-welded design in their fabrication of this building for several reasons: the economies, materials and labor; the ease, as the job could be done entirely on the site with no shop fabrication of members and with a minimum of equipment on the site. Actually, they used only five pieces of equipment on the job: two arc-welding machines, two cutting torches and one small angle shear.

* President, Lincoln Electric Co. of Canada, Ltd., Leaside, Ontario, Canada.

Fig. 1—Front View of the All-welded Four-Bay Structure Designed and Built by the Leeson Tractor and Implement Co. of Chatham, Ontario. The Structure Is 200 Ft. 8 In. Long and 151 Ft. 4 In. Wide

Fig. 2—Interior View of the Completed Structure Showing the Wealth of Room Afforded Through Arc-Welding Design, Which Eliminates the Setting of Columns Supporting the Structure Throughout the Interior

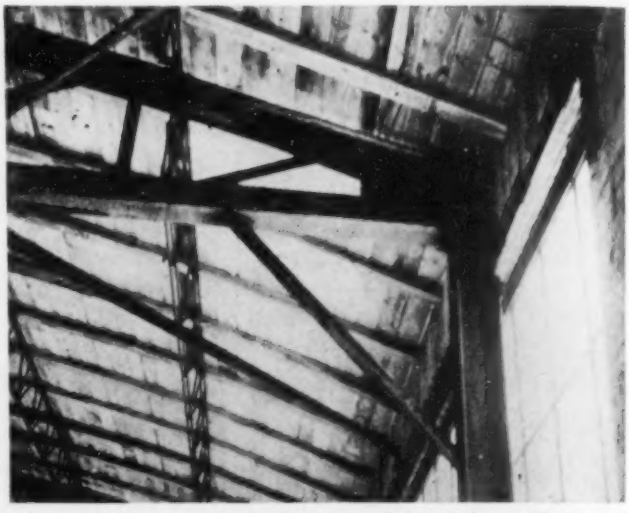


Fig. 3—View Showing the Junction of the Column, Beam and Truss, Which Were Arc Welded at Their Junction. The Purlin Structure Can Also Be Seen in This View

Fig. 4—Another View of the Roof Beams, Trusses and Purlins

The specific advantages resulting from this new building design have roused new opinions in the minds of many Canadian builders at the present time, for the greatly increased strength, reduced weight of steel, the improved interior appearance (see Fig. 2), and lower costs in materials, equipment and labor are salient factors that they will have to contend with in future contracts.

Canadian Standard 12- x 5-in. split I-beams with 2- x 2- x $^1/_4$-in. angle struts were used for trusses (see Fig. 3). These were split and braced for their role as trusses. The column sections 6- x 6-in. H-beams, and 8- x 4-in. I-

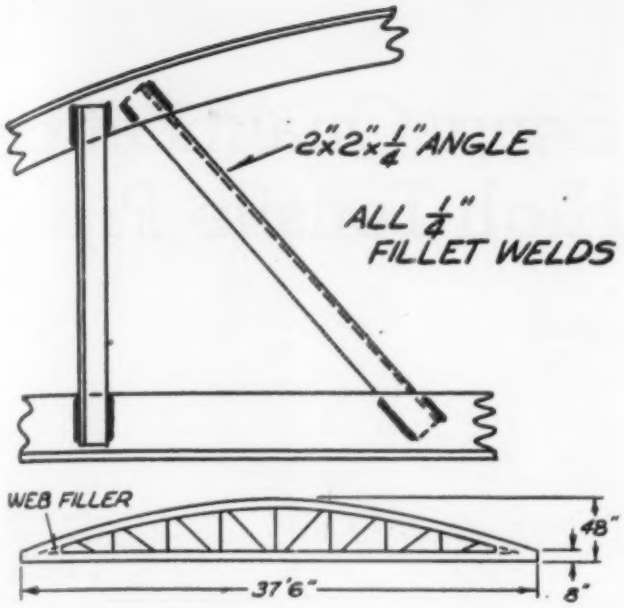


Fig. 5—Sketch Showing the Detailed Structure of the Trusses and the Welds in the Truss Structure

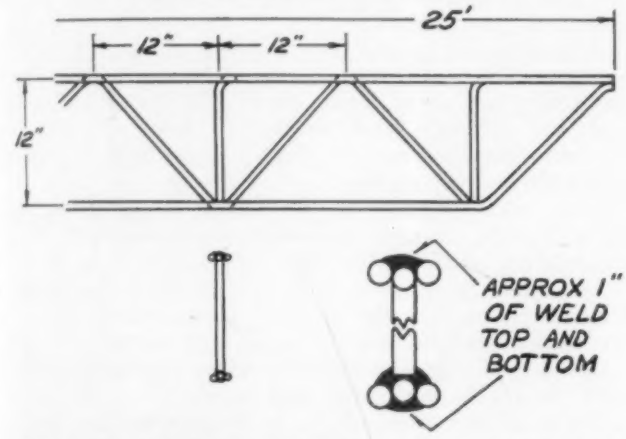


Fig. 6—The Sketch in This View Gives an Interesting Study of the All-Welded Rafter Design

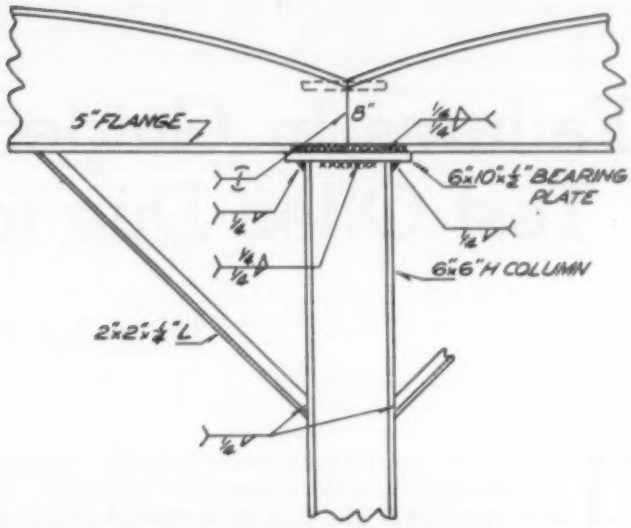


Fig. 7—The Truss-to-Column Welding (Not at the Outside Wall) Is Clearly Illustrated in This Sketch, as well as Detailed Information Regarding the Component Parts

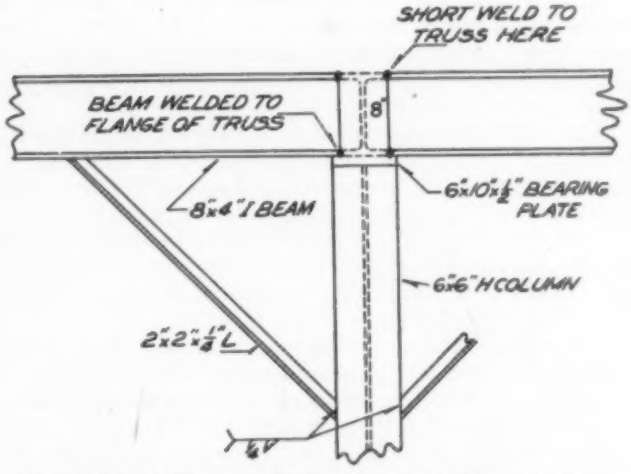


Fig. 8—Sketch Giving a Detailed View of the Beam-to-Column Welding Used in the Construction of This Building by the Leeson Tractor and Implement Co.

beams were used for the connecting beams. The roof rafters, or purlins (see Fig. 4), were made from $^9/_{16}$-in. steel rods. All these materials are of excellent structural and weldable quality, being S.A.E. 1015.

The trusses are 37 ft. 6 in. long with a 48-in. rise in the center, and weigh approximately 1300 lb. each (see Fig. 5). The rafters are 20 ft. long, the columns are 11 ft. 3 in. long (see Fig. 6) and the beams are 20 ft. in length.

The all-welded design of this structure was so impressive to the minds of the builders, who at the same time are the owners, that no other design was given any consideration.

The use of arc welding greatly expedited the erection of the building. The 40 trusses were fabricated and erected at a rate of two per day, entailing two men totally employed for 20 days. The 320 joists were fabricated at a rate of one per hour, or ten per day, entailing one man 32 days to complete the task. The welding of the structure took 35 days, and was accomplished with three operators working steadily.

None of the structural welding was first tacked before the final welding was accomplished, as simple jigs were used instead. Most of the welding was flat, except truss to column and beam to column joints (see Figs. 7 and 8). The trusses and rafters were set up in simple jigs and welded, but other than these there were no other jigs or positioners used.

Fillet welds, largely $^3/_{16}$-in. and $^1/_4$-in., made with $^3/_{16}$-in. shielded electrode at 200 to 225 amp., were used extensively in all the structural welding. Most of this welding was made in a one-pass downhand method, with no problems such as distortion or the need for preheating encountered.

The approximated cost of the erected steel work, including primarily the materials and labor, totaled $8000, while the approximate cost of the completed structure totaled $38,000. The latter figure includes all materials, steel, lighting fixtures, heating appliances, masonry and miscellaneous items, but makes no allowance for the time of Mr. W. Leeson, the owner, who supervised all the work.

This building, with its modern all-welded rigid design, is an outstanding example of the new trend in the structural field.

Failures in Guided Bend Qualification Test Often Due to High-Tensile Pipe

By L. K. Stringham*

TODAY the guided bend test is generally used as a qualification test for operators. Actually, the operator is only one of three important factors to be considered in applying the guided bend test. The other two factors are the electrode and the plate material.

The electrode, if it has received an A.W.S. classification, is guaranteed to be satisfactory for passing the guided bend test as described in A.S.T.M. A-233. However, many electrodes will pass this particular test and yet will not pass a guided bend test made in a pipe joint which has no back-up strip.

The plate material is an equal factor in the guided bend test. Some plate material which will meet all of the requirements of the specification for which it was made and which will perform satisfactorily as part of a welded pipe or structure will fail in the guided bend test regardless of the ability of the operator to deposit a sound, well-fused weld and the ability of the electrode to deposit sound ductile weld metal.

The responsibility of the operator should be established before the test is administered. He should be responsible for the deposition of good sound weld metal which is well fused to the parent metal. Therefore, if the guided bend test is used, an operator should be permitted to qualify even though the sample itself fails, providing the sample shows good fusion. Such failures are not caused by the operator and certainly should not be charged against him.

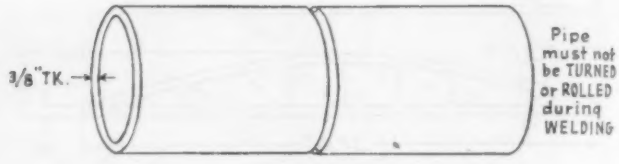


Fig. 1

As long as the guided bend test is a standard by which operators are qualified, minimum difficulty will result in qualifying operators if the pipe used for qualification tests has a tensile strength that is about equal to the minimum tensile strength allowed in the specification to which the pipe is bought.

Using electrodes of higher tensile strength on the higher tensile strength plate will not normally help, as this will not improve the ability of the pipe to bend.

Very frequently, welding operators have considerable difficulty in passing the operator qualification test, and oftentimes wholesale failures occur in a routine requalification test among experienced welders who have successfully passed the very same test before.

These failures often appear in the pipe welding test in which the axis of the pipe is horizontal (Fig. 1).

Invariably failures occur on the root bend tests. Examination of the failure will usually disclose a small spot where the fusion was incomplete, and this could satis-

* Engineer in Charge of Welding Application, The Lincoln Electric Co., Cleveland, Ohio.

Fig. 2

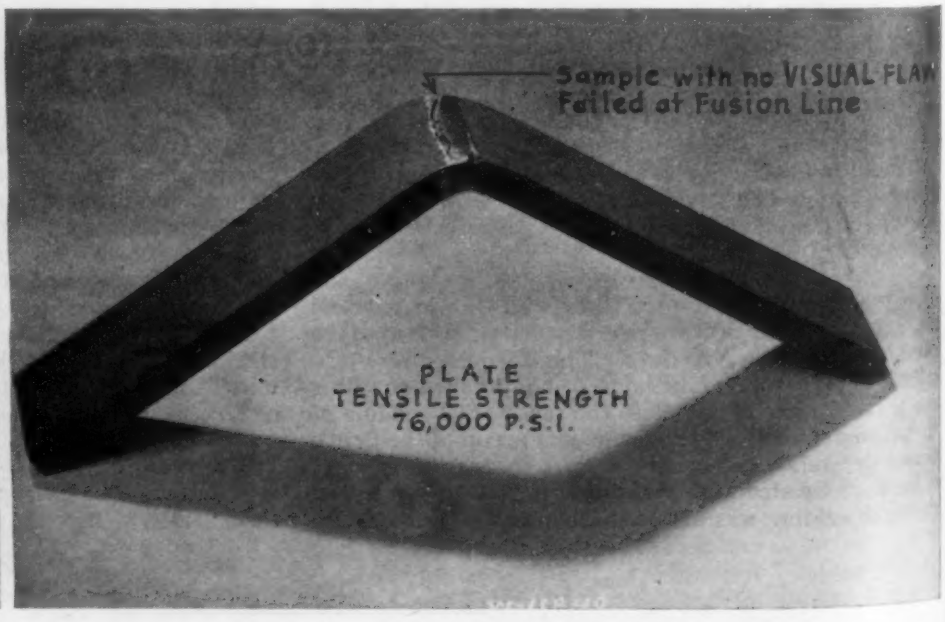


Fig. 3

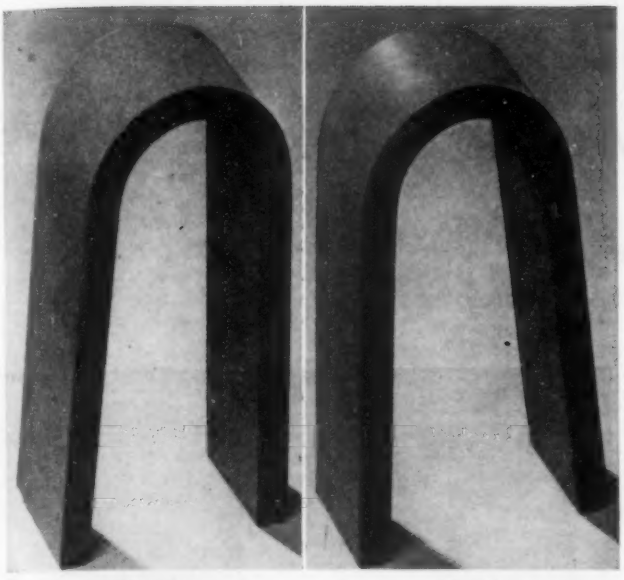


Fig. 4

Fig. 5

these two samples were notched by machining a groove $^{1}/_{32}$ in. deep and $^{3}/_{64}$ in. wide across the face prior to bending, the 76,000 psi. steel fractured on bending, and the 62,000 psi. pipe bent 180° without fracture (Figs. 6 and 7).

In checking the elongation of the weld metal in the specimens shown in Figs. 2 and 3, it was found that the weld metal had elongated 22% on the 62,000 psi. plate in bending 180° without failing, while the 76,000 psi. specimen had elongated 37% when the failure occurred at a bend of 70°.

From these experiments, it is possible to draw certain conclusions which may be valuable in considering qualification tests.

Normally, pipe of approximately 60,000 psi. tensile strength is sufficiently ductile so that relatively large notches or flaws in the surface in tension will not cause failure in the guided bend test.

Pipe of 75,000 psi. or higher tensile strength will probably fail in the guided bend test if there are slight flaws or notches in the surface, that is, in tension.

Since pipe, either in the manufacture or fabrication, is certain to have some flaws or imperfections, specimens

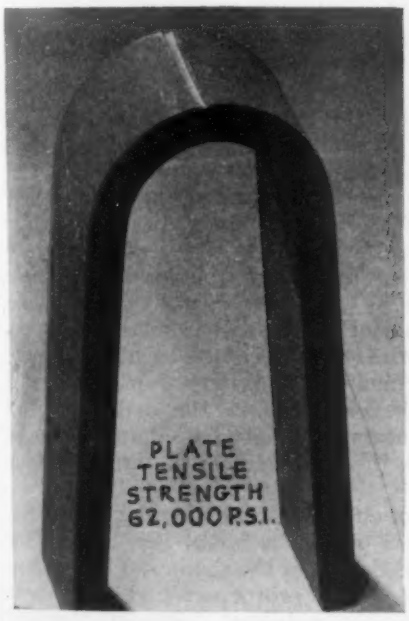


Fig. 6

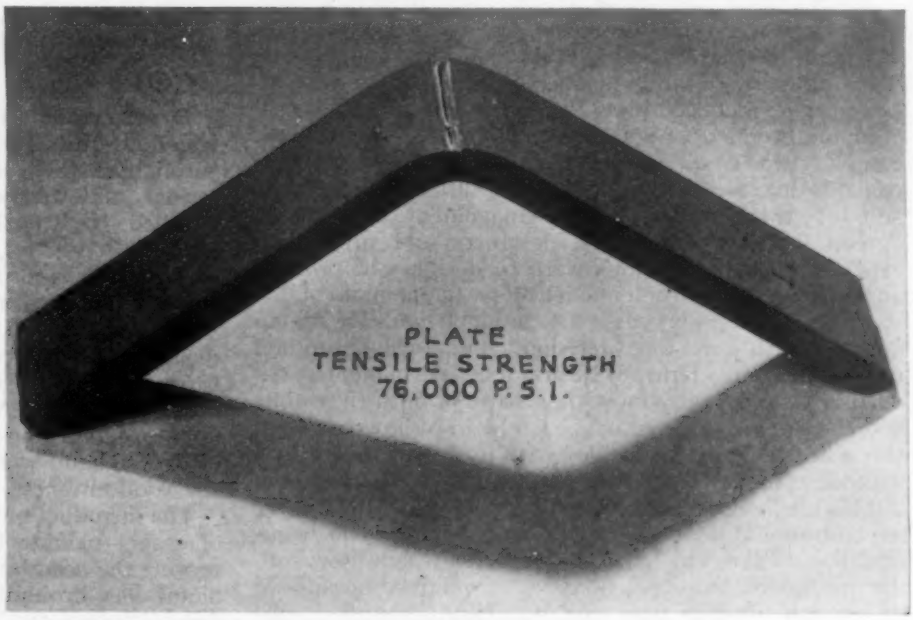


Fig. 7

factorily explain the failure except that very often samples, having obviously greater imperfections, will bend without a sign of failure. This is graphically illustrated in Figs. 2 and 3.

Both samples shown were prepared in the same way, welded with the same electrode, by the same operator, on the same day. Only the properties of the pipe differed in the two tests. The sample in Fig. 2 was welded, using pipe which has a tensile strength of 62,000 psi. The pipe used in Fig. 3 had a tensile strength of 76,000 psi.

To show clearly the differences in properties of the two different steel, unwelded sections were prepared and bent as guided bend samples. As illustrated in Figs. 4 and 5, both bent successfully. However, when the surfaces of cut at random from a pipe will not all pass the guided bend test, and yet all weld specimens cut from a welded joint must pass the guided bend test if the operator is to qualify. Therefore, the operator has two strikes against him before he starts if the pipe which he is welding has a high tensile strength.

Normal bead ripples or tiny depressions which are not ground out are likely to produce failure at the fusion line even though the weld metal is solid and ductile.

Therefore, because of these conditions, the guided bend test cannot be regarded as a sound test for qualifying operators, or for that matter, electrodes. As the test is now written, it is easily possible, by proper choice of pipe, to fail a good operator or pass a poor operator.

All-Welded Metal Casket

By W. P. Brotherton*

SOMETHING new has happened in the casket industry. A steady stream of graceful, gleaming metallic casket shells is flowing from the million dollar production line of the Ryan Aeronautical Co. at San Diego, Calif. *Here, for the first time, high-quality, chrome-nickel alloy casket shells are being completely fabricated and assembled on a moving assembly line similar to that used in the manufacture of automobiles.* The Company has invested over $1,000,000 in precision tools, dies and modern equipment to build an entirely new and distinctively designed casket by the most modern methods.

With a 25-yr. history of achievement in building airplanes and aviation equipment, the Ryan Aeronautical Co. made a careful study of casket manufacturing before deciding to enter the industry. Because of the vast experience in metal forming gained as the nation's outstanding producer of stainless steel exhaust systems, the company was confident that it could make an important contribution to the metallic casket industry. As a result of this analysis, our management flashed the "green light" to engineers, designers and production experts. The instructions were to design and produce an entirely new chrome-nickel alloy (a member of the stainless steel family) casket shell which could be manufactured with jewel-like precision. The finished product must be strong, light, beautiful and permanently enduring. It must fully meet the desires of both the public and the funeral director. The problem of how to attain this objective must be tackled with fresh enthusiasm and without preconceived notions of what could not be done.

This challenge was successfully met. The most striking testimonial to that accomplishment is the 500 beautiful Ryan "Grecian Urn" casket shells which flow from the production lines each 30 days. So named because of its smooth, flowing lines and beautifully rounded contours, the "Grecian Urn" has created a new concept in metal form.

* Technical Editor, Ryan Aeronautical Co., San Diego 12, Calif.

Fig. 1—The Grecian Urn by Ryan

A unique casket shell whose beauty and permanence are establishing a new standard in the industry. "Sculptured" from chrome-nickel alloy on a million dollar production line, the Grecian Urn is strong, light and permanently enduring. Nineteen tons of high-precision, polished steel dies are used to form its 150 completely interchangeable parts. An all-welded, one-metal casket shell, it has been designed to provide the utmost in sealed protection.

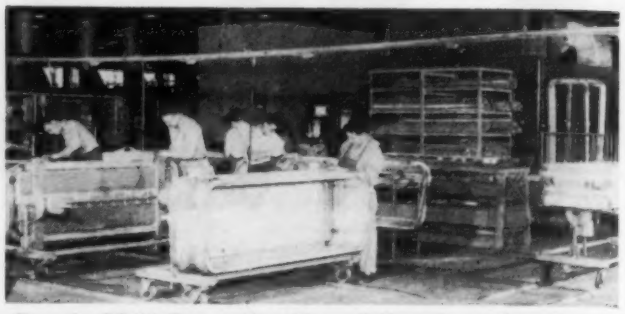


Fig. 2—Weld Seams Are Ground Smooth as the Chrome-Nickel Ryan Casket Shell Flows Along the Assembly Line in the San Diego Plant

Ryan manufactures the complete metal casket shell which is shipped to carefully selected casket companies throughout the United States who apply their own interiors and trimming. All national distribution is handled by the Earl T. Newcomer organization of Kansas City, Mo., who were selected because of their outstanding record of service to the industry over a period of many years.

The building of burial caskets is one of the oldest industries. For centuries, they have been made of various types of wood. Ingenious methods for staining and finishing wooden caskets evolved. Like the making of fine furniture, this fabrication involved a considerable amount of expert hand work in shaping, painting and polishing the wood surfaces.

The introduction of chrome-nickel alloy to the business of casket making has opened a broad new avenue for serving the needs and desires of the public. This modern metal has brought ageless protection and permanent durability to the casket industry. Recent National Bureau of Standards tests indicate that chrome-nickel alloy has many times the life of other casket metals and, when subjected to simulated burial tests, shows no signs of deterioration.

The chrome-nickel alloy used for casket shell manufacturing is exceedingly strong. It has a tensile strength of 82,000 psi.—which is twice the strength of copper-bearing steel and commercial bronze and nearly three times that of copper. This unique advantage is translated into a lighter weight casket.

The Grecian Urn weighs only 300 lb. because the strength and durability of chrome-nickel alloy makes it possible to provide the utmost protection at light weight. To further augment this strength, our designers have incorporated an all-welded, bridge-type construction in its design. Funeral service industry representatives from all over the nation have visited the Ryan plant to scrutinize this new type of structure. The consensus of their opinion is, "The 300-lb. Grecian Urn is to the funeral service industry what the streamlined train is to the railroads."

Only quite recently has chrome-nickel alloy become available for the fabrication of beautiful caskets. This

rustless alloy is exceedingly tough, springy and difficult to form. Consequently, the problem of creating the sleek, curved contours which the public desired assumed major proportions. The Company has accomplished this task by using 19 tons of polished, high-precision, steel dies to form the 150 parts of the Grecian Urn. Many new techniques, employed for the first time in casket making, are used to obtain its smooth surfaces.

The Grecian Urn is undoubtedly the first complete metal casket in which all parts are absolutely interchangeable. This desirable feature is a result of precision methods of manufacture and the fact that every part, including hinges and catches, is produced in the 43-acre Ryan plant.

The casket shell is practically a one-metal product because every joint is welded with the same chrome-nickel alloy of which the casket itself is composed. This is a distinct contrast to the customary method of lead soldering the joints in ordinary metal caskets. Lead-soldered joints have ruptured when subjected to stresses in shipment. This cannot occur with the Ryan casket shell. *Every joint in the Grecian Urn is a 100% joint with more strength than that of the material itself.*

A special feature of our casket shell is air-tight sealing without the need for using bolts, screws or tools to install and remove the sealer frame. The attractive sealer frame and curved glass cover can be removed or installed in less than one minute by simply operating five toggle-type latches. These hinge assemblies require no tools. They provide the pressure which forces the sealer frame against a Neoprene rubber tube seal to insure positive sealing.

To secure the maximum protection, our engineers specified that no punctures were to be made in the casket shell as it was fabricated. This obviated the need for sealing these holes and made the casket a more complete structure. Most metal caskets are punctured 32 times to attach the handles alone. Handles on the Grecian Urn are attached to a separate strip of chrome-nickel-alloy which is welded to the outside of the casket body and no penetration is performed.

Like a well-engineered automobile, the Grecian Urn is both fabricated and assembled as it travels down the continuous Ryan production line to emerge a completed product at the extremity of the line. First step in the process is the selection of the highest quality chrome-nickel alloy sheets which can be purchased from the mills. This metal is scrutinized to see that it is free from impurities and surface flaws. Tiny imperfections can grow to rejectable blemishes under the severe stretching necessary for forming the oval lines of the casket shell. The acceptable material is then cut and tailored to size for the individual parts.

Most of the 150 parts are formed between polished Meehanite dies which are forced together in the huge hydro-press. This mighty machine squeezes the metal with a crushing pressure of 2,000,000 lb. forcing it to flow over the precision dies and take the shape that designers have created for it. The finest steel dies are demanded by this exacting work.

The formed parts are meticulously cleaned and placed upon especially made steel carriers (dollies) which start them on their long continuous journey through the production line. The dollies roll down the plant on wheels which travel in steel tracks, carrying the parts through each work area. On the way, frames, panels, bottoms and sealers are electric arc welded and assembled.

The unique beauty of the Ryan Grecian Urn is attributable to its unusual design and finish. To achieve

Fig. 3.—Frames, Panels, Bottoms and Sealers for the Ryan Grecian Urn Are Fabricated by Electric Arc Welding as the Parts Begin to Move Down the Continuous Assembly Line in the Ryan Aeronautical Co. Plant

contoured symmetry in its design, 6-in. radius corners are formed for the base and top. These and other radii are probably in excess of those used in any casket.

A gleaming, lustrous finish which conveys the impression of depth characterizes the casket shell. This distinctive finish creates the illusion that its color and lustre emanate from beneath the surface at an appreciable depth. It seems to glow from within in the four finishes available: Platinum, Grecian Bronze, Statuary Bronze and Sunset Bronze.

Great care is taken to obtain the surface finish. Special acid solutions for removing dirt, grease and other impurities are applied as the casket shells move down the assembly line. The primer coats are sprayed on and quickly dried and cured in an infra-red drying tunnel. This fast, modern method has been developed from many consultations with representatives from the General Electric and Sherwin-Williams Paint Companies. The Grecian Urn has a seven-coat finish, every one of which is sanded, rubbed and polished before the next coat is applied. Glass-like smoothness is attained by employing both machine polishers and hand rubbing.

At the final work area, the casket shell receives a painstaking inspection to see that it is perfect in every detail. Then it is carefully packed in a heavy wooden box and shipped to a casket manufacturer who will install its interior trim.

Each Grecian Urn goes to the casket industry as an example of the finest in material and workmanship which manufacturing can produce. Nothing has been spared in its concept, design and fabrication to make this casket shell truly a jewel in beauty, strength and permanence.

All-Welded Prefabricated Sandwich Shops Shipped Completely Assembled Anywhere in the United States

By R. H. Davies*

PREFABRICATED sandwich shops, of all-welded stainless steel and aluminum construction, are currently being manufactured and distributed nationally by Valentine Industries, Inc., of Wichita, Kan.

Requiring only the construction of a foundation at the location site, the shops, measuring 24 ft. by 10 ft. are shipped as complete units (Figs. 1 and 2) to any section of the country by rail freight or trailer.

Shielded arc-welding equipment is used to weld the connections of the unit parts which are fabricated at the plant of The H & H Parts Co. in Wichita.

Six-inch channel members, rigidly welded at the corners, are used as the base frame of the building. During fabrication, the frame is placed in a jig which has been mounted on wheels to permit freedom of movement and thus maintain production on an assembly line basis.

At 2-ft. intervals across the 10-ft. width of the building, 4-in. channels are welded to the base frame to serve as floor joists.

Twenty-gage steel sheets, specially fabricated to identical sizes and interlocking in design, serve as side walls. The panels are welded to the base frame and to the adjoining panels at 6-in. intervals and are then welded to the top angle ring, a 2-in. x 3-in. angle. In addition to providing a stiffener for the wall panels, the top angle ring serves as a base for the roof panels, which are also fabricated from 20-gage steel sheets.

The roof panels are then securely welded to the 2-in. leg of the top angle ring and to each other in a manner similar to the welding of the wall panels (Fig. 3). The ceiling panel flanges which have a 4-in. drop in nine feet, are filled with about 4 in. of metallic insulation. A 3/4-in. lap insulation board is then laid across the roof panel flanges and fastened with screws. The laps in this insulation board are covered with 4-in. metal strips. Corrugated roofing is laid on top of the insulation board and flashing is provided at the front and back to allow water to run toward the rear of the roof. Three drain spouts are provided on the back side.

The parapet is fastened to the wall panels and the insulation holes in the panels are covered with snap-on metal strip. The metal roofing is then faired into the parapet and the entire roof is covered with tar.

Twenty-gage steel sheet is also used for the floor of the building and is welded to the channel floor joists (Fig. 4). Later, a surface covering of 1/2-in. magnesite floor base is applied. A 1/8-in. thickness of asbestos tile is used to reinforce those areas where the greatest amount of wear is anticipated. A floor enamel finish is used on the uncovered sections of the floor.

Installation of the electrical system consists of welding the conduit and outlets to the steel framework, a factor which simplifies subsequent wiring operations.

Window frame installation is begun at this point. The frame has an inner and outer angle of sheet-steel stock, the inner frame angle being of stainless steel. A 2- x 3-in. angle, welded to the top ring and to the base frame, is used to reinforce the panel above the window frame and the panels to either side of it. Installation of the glass follows with spring clips and is caulked. An

* Consulting Engineer, The Lincoln Electric Co., Cleveland 1, Ohio.

Fig. 2—Interior of Completed Shop Showing All Equipment in Place Ready for Shipment

Fig. 1—Architect's Drawing of Weld-Fabricated Sandwich Shop Built in Unit Ready for Shipment

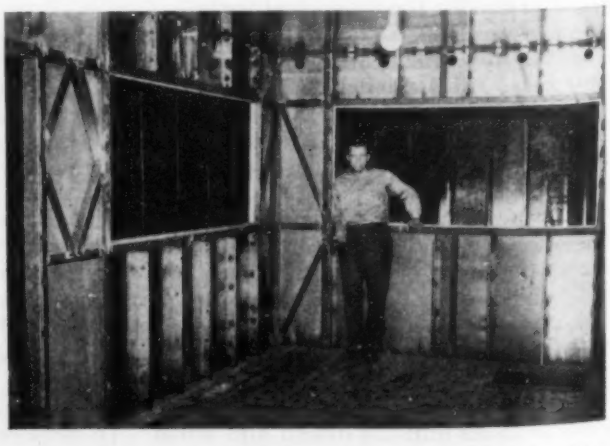


Fig. 3—Interior of Sandwich Shop, During Construction, After Wall Panels, Flooring, Ceiling and Window Frames Have Been Completed

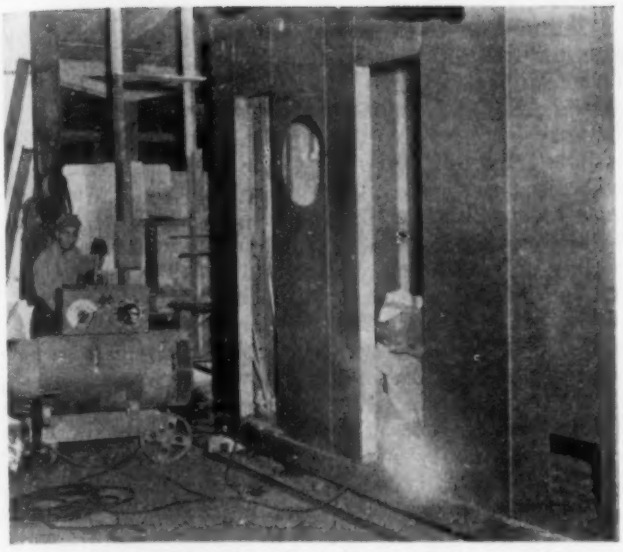


Fig. 4—Twenty-Gage Sheet Steel, Used as Flooring, Is Welded to Channel Floor Joists and to the Base Frame

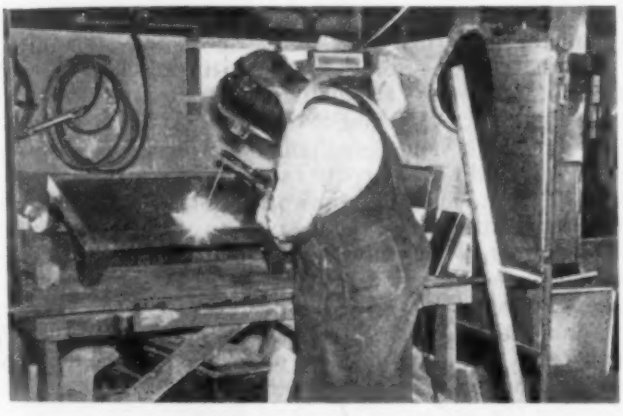


Fig. 5—Operator Is Shown Using Lincoln Shielded Arc Equipment to Weld the Stainless Steel Griddle

extrusion is then screwed to the outside of the frame to hold the glass in place.

For purposes of insulating the structure, a $^1/_2$-in. layer of sheet rock is used to cover the panels. Drive screws are used to fasten the insulating material to the panel walls and a follow-up covering of light-gage aluminum sheeting is applied. Insulation is completed by pouring metallic fireproof insulation in through holes provided in the four walls for this purpose. The ceilings are also covered with the aluminum sheeting.

To provide attractive finishing for the interior of the sandwich shop, synthetic enamel is sprayed on all of the panels and a trimming of snap-on stainless steel is provided.

Because of its fine appearance and durable qualities, stainless steel is always used in the construction of the portable sandwich shops. Even the heavy-cord door is covered with stainless steel.

Welding, which has played such a prominent role, in constructing the building itself, is also extensively employed to build the fixtures for the shop.

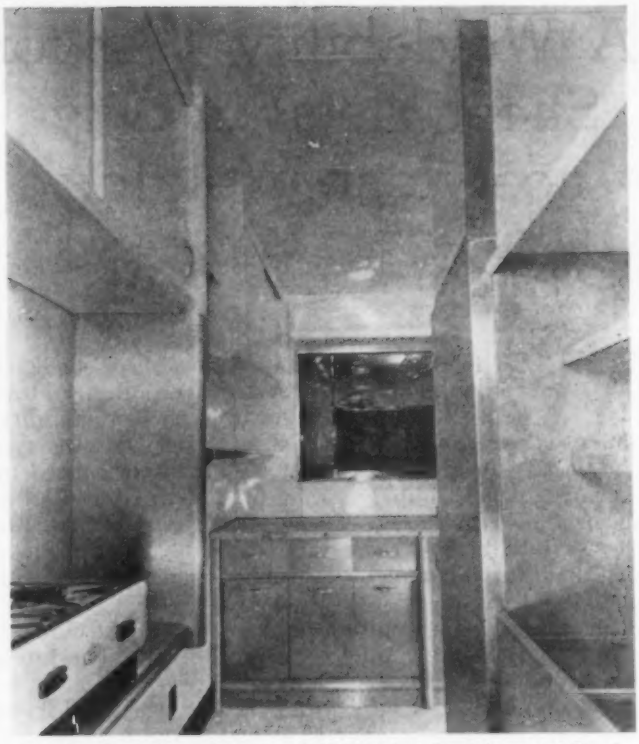


Fig. 6—Completed Interior of All-Welded, Prefabricated Sandwich Shop, Ready for Shipping

The range, which is fabricated by flame cutting and arc welding (Fig. 5), has a fry griddle and a four-pot dry-heat table, work and heating space on its top and cabinets above and below for storage. The sheet metal portions of the stove and the smoke hood are stainless steel. For purposes of sanitary considerations and appearance, aircraft design features are incorporated. The sheets are formed with a curved edge and rounded corners in order to provide the stiffness necessary to maintain the structure while, at the same time, eliminating all overlapping joints and sharp corners which would present a cleaning problem.

Stainless steel clad plate, welded to the stove frame to avoid grease leaks, is used as the griddle. The use of clad plates provides a stainless surface for cooking, backed up with a heavy mild steel plant to withstand the heat of a continuous fire.

The use of sliding doors, which may be easily removed, is a feature which contributes to easy cleaning.

Fabrication of a 14-cu. ft. mechanical refrigerator and a floor cooler by the welding of stainless steel sheets is another advancement scored by the manufacturers of the sandwich shops.

The completely assembled, all-welded sandwich shops are rugged enough and rigid enough to withstand all of the strain which shipping cross-country can impose. They are delivered with counter and stools and even shelves already erected (Fig. 6) and mirrors hung.

A Weldability Test for Sheet Metal in Oxyacetylene Welding*

By R. Woirin†

WE KNOW that certain lots of sheet steel give trouble in oxyacetylene welding. These sheets are said to exhibit poor weldability. The usual weldability test for sheets consists in fusing a line on the surface of the sheet. This test was used by a firm that had trouble welding tanks of a certain lot of sheets 0.059 in. thick. The welded tanks leaked. In the weldability test there was either no penetration or the metal fused completely through, causing a hole with badly oxidized edges.

Since this test is qualitative at best, it was decided to investigate the weldability test proposed by The Linde Air Products Co. in 1930. In this test a sheet 6 in. square is placed flat on a table. Using a neutral flame and a tip one size smaller than usual, the blue cone is held $^1/_8$ in. above the sheet. The flame is moved slowly over the sheet so as to fuse it throughout the thickness without burning the metal. After a band 3 in. long has been fused, the torch is held motionless to melt a hole. If the sheet is of excellent quality, the fused band will contain no excess oxides on the upper side and will be smooth and regular. The reverse will be slightly bulged but smooth and free from oxides. The hole will be round and will have smooth rounded edges. Sheets of poor quality will have a deposit of oxides on the upper side and the hole will be irregular with spongy globules of oxides on the edges. Less time will be required to melt the hole than with a sheet of good quality.

Instead of the time required for perforation the present research indicates that it is preferable to use the diameter of the hole as the criterion of weldability. The sheet to be tested is supported on a ring stand with the torch clamped directly above.

Preliminary tests showed that it was immaterial whether the torch was of high- or low-pressure type. The distance between blue cone and sheet was held between $^3/_{32}$ and $^1/_8$ in. in the tests. Variations in this distance from zero to 0.20 in. had practically no effect on hole diameter. In order to make at least ten holes on each sheet to secure a good average value, it was necessary to standardize on a sheet 8 in. square. It was decided not to cool the specimen after each hole, because cooling in water greatly increased the distortion and did not increase the consistency of measurements.

The reason for discarding the time of melting as a criterion of weldability was that the results were very erratic although the melting time was longer for good sheets than for bad. The erratic time values appear to be due to variations in the layer of oxide on the sheets and the difficulty in determining the time at which melting begins. It was suggested that the diameter of the ring of temper color around the hole be used as a criterion of weldability. However, it was found that the extent of the temper colors depended on the extent to which the secondary flame of the torch impinged on the sheet. The appearance of spongy oxide is, of course, an indication of weldability, too, but cannot be reduced to quantitative terms.

All in all, it was found for sheets up to 0.079 in. thick that the diameter of the melted hole was the best criterion of weldability. For ingot iron and mild steel sheets 0.079 in. thick, holes less than 0.32 in. diameter indicated poor weldability. For sheets 0.025 in. thick, holes less than 0.21 in. diameter indicated poor weldability. In a series of ten holes the dispersion in measurement of hole diameter does not exceed 10%. The test is not recommended for sheets over 0.079 in. thick because viscosity exerts too great an effect on the hole diameter.

Among the factors that affect the diameter of the hole the size of the torch may be mentioned. The diameter varies inversely with the power of the torch. Also cleaning the surface of the sheet decreases the size of the hole. Annealing the sheet before testing reduces the dispersion of measurement but has little effect on the average diameter.

This test has also been applied to aluminum fluxes. The torch melts only a small hole in a bare aluminum sheet. However, with a good flux covering the surface of the sheet a large hole is melted. Depending on the quality of the flux, the hole may vary from 0.20 to 2.0 in. diameter. So long as the surface was covered, the quantity of flux had no effect on the diameter of the hole.

* Abstract of "UnEssai de Soudabilité Opératoire," published in *Soudureet Technique Connexes*, 1, No. 3/4, March–April 1947, pp. 48–55.

† Translated by G. E. Claussen, Chief Metallurgist, Reid-Avery Co. Baltimore, Md.

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Inert-Arc Welding Stainless Steel Belt

By M. J. Conway*

A 200-ft.-long strip of Type 302 stainless steel strip, 36 in. wide and 0.30 in. thick, was successfully welded into an endless belt on the first try in a large Eastern chemical plant recently by using the Inert-Arc welding process with the thin sheets slightly overlapped at the start of the weld. This method, developed by General Electric welding engineers as an improvement over a straight butt joint, reduced distortion and provided adequate reinforcement without adding filler material.

The welding operation presented a number of difficult requirements. One side of the thin belt was highly polished; surface variations allowable were only a few millionths of an inch.

The weld had to be sound and capable of being ground flush and polished to a finish equal to that of the belt surface. It had to withstand the transverse tension caused by the belt being stretched tight and flat. The fatigue produced by the joint being flexed over drive rolls could not cause failure. The belt had to be exactly equal in length along both edges with no slack in the middle. No warping could be tolerated, because it would lead to the creasing that spoiled the belt being replaced.

The belt was welded successfully the first time it was tried. This was important because the costly belt was already threaded into the machine. Shearing out a bad weld and rewelding would have been difficult, and could not have been done more than twice without making the belt too short.

The belt was welded with an air-cooled manual Inert-Arc electrode holder clamped to a crawler-type travel carriage which traversed the joint at a uniform rate of 6 in. per minute. A tungsten electrode, $^1/_{16}$-in. in diameter, was used with 47 amp. of direct current, straight polarity. Argon welding gas at the rate of five liters per minute was used to shield the arc. This is equivalent to 10.5 cu. ft. per hour. Since this is also equivalent of only 3 to 4 psi. of pressure, a flowmeter was used to measure gas regulation.

By making trial welds on sample joints, a procedure was established to prepare the belt for successful welding. One end was cut square across. This end was then clamped moderately firmly in the fixture, so that it projected halfway across the groove in the backing bar.

The other end was first cut square, and then draw-filed to form a very shallow arc. This arc was such that a straight-edge placed against the end of the belt would show a gap of about $^1/_{32}$ in. at the center. The gap was tapered down at both sides until contact was reached about 4 in. from each edge of the belt.

This trimmed end was then clamped—a little less firmly than the square-cut end—so that it overlapped the square-cut end about $^1/_{16}$ in. at the start of the seam, and just barely overlapped it at the finish. The top copper chill clamps were $^1/_4$ in. apart, aligned with the groove $^5/_{32}$ in. × 0.025 in. in the copper backing bar.

The bead, as welded, was very smooth, uniformly $^1/_8$ in. in width, and about $1^1/_2$ times the material thickness. The majority of the reinforcement was on the under (root) side. The belt on either side of the weld was in the same plane.

The weld was homogeneous and free of cracks or pinholes. The bead was ground flush on the back, and it was ground and polished to the vanishing point on the mirror-finished working side of the belt.

The theory behind this procedure is quite simple. It is to adjust the rate of heat input to the point of very rapid fusion, but not too great to prevent equally rapid freezing of the weld metal. The copper chill bars and backing remove heat from the molten metal rapidly to give fast freezing. This causes the weld metal to pass rapidly through its critical range both in fusion and freezing. Moderate clamping allows the parent metal to slip before cracking stresses can build up while the weld metal is in its critical range.

In this critical range between 525 and 800 C, a carbon content exceeding 0.08% will precipitate out of the alloy. This precipitated carbon will draw chromium

* Electric Welding Division, General Electric Co., Schenectady, N. Y.

from the alloy to form a chrome carbide network among the grain structure. This network plus the chromium impoverishment of the alloy reduces its physical properties under stress.

The New Stainless Steel Electrode Specifications

By R. D. Thomas*

FOR about five years, a Subcommittee of the AMERICAN WELDING SOCIETY's Filler Metal Committee has had the assignment of proposing a specification for Corrosion Resisting Chromium and Chromium-Nickel Steel Welding Electrodes (Stainless Steel Electrodes). The war slowed down this work considerably, but in the latter part of 1946 final approval by both the A.W.S. and the A.S.T.M. was granted to the draft submitted by the Subcommittee. In its printed form it is available at the New York office of the AMERICAN WELDING SOCIETY.

A specification for the weld metal from stainless electrodes presents problems differing widely from those presented by steel electrodes. The most important of these problems is involved in the name "stainless," which name is in itself a misnomer. There is no such thing as a "stainless" metal, be it weld metal, rolled metal or cast metal. Because of this fact, the title to these specifications is "Corrosion Resisting Chromium and Chromium-Nickel Steel Welding Electrodes." Specifically, these specifications include those electrodes containing chromium only, or those containing both chromium and nickel where these alloying elements are used to make a metal to resist corrosion. Note that the verb in front of the word corrosion is "resist" and not "prevent." Since the metal does not prevent corrosion, it is not truly stainless. Casual observation of stainless automobile bumpers and trim confirms this fact. Furthermore, any one analysis of "stainless" metal resists corrosion to a greater or less extent, depending on the corroding medium to which it is exposed, and upon the heat treatment to which the metal had been subjected. Also, differing stainless analyses resist corrosion of the same corrosive medium to differing degrees.

For these reasons, there is no one or two of the many accelerated corrosion tests that would properly control this quality of the weld metal. This fact faced the Committee with the problem of specifying tests for the weld metal to eliminate faults which, if present, would reduce its corrosion resistance. Specifically, the aim of the specifications is to determine whether the weld metal is sound and whether it is of the proper chemical composition. This aim is attained by the mechanical qualities of an all-weld metal sample and the chemical analysis thereof. Defects in the weld metal, such as porosity and cracks, will seriously reduce corrosion resistance. The mechanical tests will show them up. Deficiencies or excesses in important alloying elements will adversely affect the corrosion-resisting qualities. The chemical analysis will show them up.

In writing the specifications as issued, the Committee did not throw corrosion testing out of the window. Part IV of the Appendix includes "Special Tests of Electrodes" which opens with the paragraph:

> "Although welds from electrodes covered by these specifications are commonly used in corrosion- or heat-resisting applications, it is not practical to require tests for corrosion or scale resistance on welds or weld metal specimens. Such special tests which are pertinent to the intended application may be conducted as agreed upon between the manufacturer and the purchaser. This section is included for the guidance of those who desire to specify special tests."

This paragraph is followed by instructions on the making of specimens for corrosion testing and of specimens for tests of mechanical properties of joints.

The problem of corrosion testing has faced every specification committee dealing with stainless alloys. A.S.T.M. committees for plate, sheet, strip and castings from these alloys have made no reference to corrosion testing except that in certain specifications the following paragraph appears:

> "If any special tests are required which are thought to be pertinent to the intended application of the material ordered, they shall be as agreed upon between the manufacturer and the purchaser."

Other technical committees have given a great deal of thought to standardized corrosion tests for stainless steels* and while much progress has been achieved many more years of use may be required before the procedures become widely accepted for controlling the corrosion-resistance quality of stainless weld metal.

The specifications include only six of the most commonly called for grades out of a total of about 30 which are on the market. It is expected that the next revision will add other of the more important grades. The Committee would welcome comments on those grades which readers believe should be added to the next revision. Comments should be sent to the Technical Secretary of the AMERICAN WELDING SOCIETY.

* Chairman, Subcommittee IV of A.W.S. Filler Metal Committee.

* See the following A.S.T.M. Standards:
Tentative Recommended Practice for Boiling Nitric Acid Test for Corrosion-Resisting Steels (A.S.T.M. Designation A276–44T).
Tentative Method of Total Immersion Corrosion Test of Stainless Steel (A.S.T.M. Designation A279–44T).
Recommended Practice for Conducting Plant Corrosion Tests (A.S.T.M. Designation A224–46).

Welded Steel Container

By T. M. Fallon*

TO facilitate loading and unloading operations and minimize breakage and pilferage of merchandise shipped by ocean-going and lake vessels, river barges, railroad cars and some motor freight carriers, Dravo Corp., Pittsburgh, has developed a 277-cu. ft. welded steel, (interlocking) weathertight shipping container, designed to carry loads up to 12,000 lb.

While steel shipping containers have been used successfully for a number of years by railroads, they are relatively new to the marine field.

Use of the Dravo shipping container is expected to help solve the serious problems of pilferage and increased cargo handling costs. The latter are reported currently to be a third to two-thirds higher than before the war. Also, their use will eliminate the need for a considerable amount of packaging materials, procurement of which has been difficult. They will enable faster loading and unloading of cargo resulting in quicker turn-around time for all types of freight carriers.

Tests of this type of shipping container in recent months have demonstrated that many economic advantages could be realized by transporters and shippers through their use. Dravo Corp. currently is building 500 of the containers on an initial production schedule, of which more than 350 already have been ordered by users.

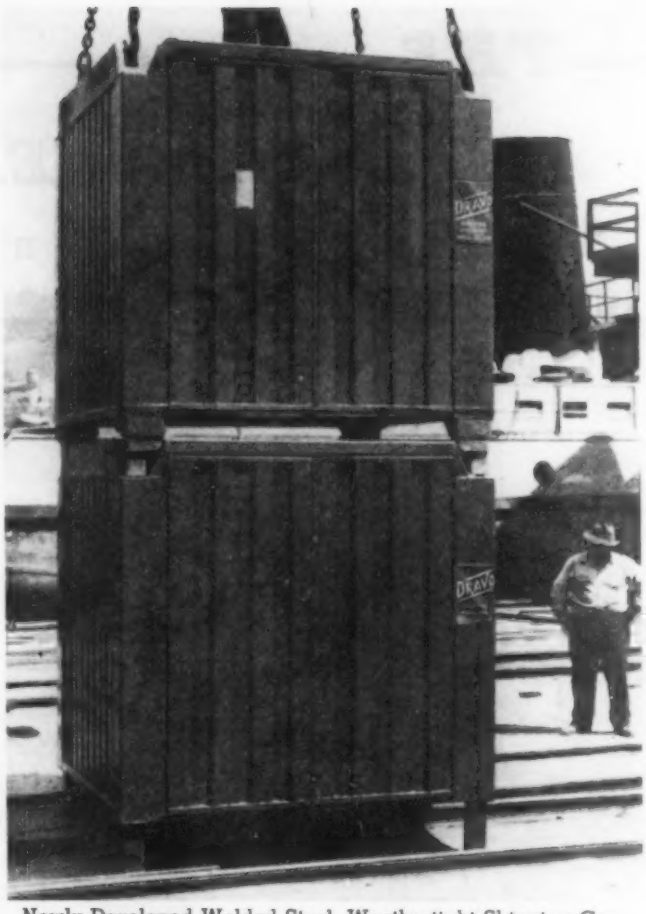
In a trial shipment of 12 containers of this type between an east cost port and Puerto Rico, material-handling costs were reduced approximately 70% of the cost when cargo is handled by customary methods. Tiering expense was cut about 90%; dock watching charges and checking and clerking costs were eliminated.

Freight transfer costs are expected to be reduced by the use of such shipping containers not only because less time is required to load and unload but because checking, sorting and distribution is simplified; identical size packages are handled and stowed; containers can be handled by mechanized equipment, and no delay is involved because of dunnaging requirements of loose cargo.

The containers interlock and fit into ships' holds 'tween decks or on railroad cars with a minimum loss of space. They absorb the force of any shock or pressure exerted by other cargo. Domestic and lighter packaging can be used for goods in the containers thus minimizing or eliminating the need for lumber, straw and other packing materials. The savings in deadweight due to lighter packaging and dunnage tends to offset container weight.

The standard Dravo shipping container is 7 ft. 9 in. long, 6 ft. 5 in. wide and 6 ft. $10^1/_2$ in. high. It weighs approximately 1650 lb. and, with a design load up to 12,000 lb., constitutes a gross weight that can be handled by most ship and pier cranes. Its capacity is 277 cu. ft.

Frame of the container consists of four corner posts formed as 9- x 9-in. open box-shaped sections in 11-gage sheet steel and connected at top and bottom by angle members. Walls are of 18-gage sheet steel formed to provide vertical reinforcing corrugations about 4 in. wide and 2 in. deep. The floor is 16-gage sheet steel laid on reinforcing 14-gage sheet steel with formed corrugations. Reinforcing straps across the bottom serve also as rests for fork trucks. The roof is of 16-gage corrugated steel covered by flat 16-gage sheet steel.



Newly Developed Welded Steel, Weathertight Shipping Containers to Facilitate Loading and Unloading Operations and Minimize Breakage and Pilferage Can Be Tiered as Shown Here to Conserve Space. Legs of One Container Fit Roof Recesses of Another. Lugs Are Provided in Roof for Crane Handling and There Is Sufficient Clearance Between Containers (and Container and Floor) for Use of Fork Trucks. Container Capacity Is 277 Cu. Ft.

Double doors, made of the same material as the walls, form an opening 57 in. wide and $71^1/_4$ in. high. Latches at the top and bottom of the door are operated by a lever which is equipped with a hasp for securing with padlock or seal.

The container is weathertight so it can be placed in the open during shipment.

For crane handling, horizontal pins or lugs are provided in the four roof corner recesses of the container. A bridle suspended from a crane boom aboard a ship or barge or on a pier can be hooked around the lugs to lift the container from a hold or deck.

Hinged legs give the containers even greater flexibility for they may be handled by either platform or for trucks. The legs are designed to fit into the roof corner recesses of another container when they are being tiered for shipment. When folded, the legs provide a floor clearance of 5 in., which is ample for use of fork truck. When upright, they have a 12-in. floor clearance sufficient for a platform truck. Stacked containers, with legs in either position, have a clearance of 4 in. between the top of one and the bottom of another.

Among the cargoes carried in what few marine shipping containers have been available so far, are: perfume, shoes, toys, drugs, various utensils, glassware, phonograph records, package and bar soap, clothing, electrical supplies, dry goods, notions, liquor, auto parts, machine parts, printed matter, paper, tobacco, canned goods and rubber goods.

* Dravo Corp. Neville Island, Pittsburgh 25, Pa.

THE AMERICAN WELDING SOCIETY

ACTIVITIES – RELATED EVENTS

J. G. MAGRATH BECOMES EXECUTIVE SECRETARY A.W.S.

For nearly a year, the Board of Directors of the AMERICAN WELDING SOCIETY has been on the lookout for a man of dynamic personality, and with the necessary experience and background to become the chief staff officer of the SOCIETY for the purpose of bringing about a closer relationship between the local Sections of the A.W.S. and the National Headquarters, and to bring about a greater appreciation of the value and benefits and work of the SOCIETY in industry at large. The growth of the SOCIETY has been steadily upward since its inception. This growth was increased quite rapidly during the war years, until we are now a medium size engineering society, whose accomplishments and activities are recognized the world over.

At their meeting on July 11, 1947, the Board of Directors unanimously selected Joseph Gordon Magrath for the position of Executive Secretary of the AMERICAN WELDING SOCIETY.

Mr. Magrath was born in Philadelphia on July 28, 1899. He is an American of English, Irish, French ancestry. He is 6 ft. 1 in. tall, weighs 185 lb., is married and has one son. "Joe" is a Registered Engineer of the State of Illinois and, in addition to being a member of the A.W.S., is a member of the American Society for Metals, Society of American Military Engineers, and the Steam Specialties Club, New York. Joe brings to the SOCIETY a greatly varied and comprehensive experience in sales, sales promotion, sales management and administration. He has been concerned in and controlled national and sectional sales policies, product surveys and associated advertising and publicity programs. He has lectured extensively on educational and technical subjects. He has had early experience as a mechanical draftsman, highway construction supervisor, and in the development of building products. He has had direct sales contact with the consumer, dealer, distributor and jobber for a variety of products, including machinery and equipment for testing chemical processes and mechanical industries. Just before joining the staff of the A.W.S., Mr. Magrath was Sales Manager of the McAlear Manufacturing Division of Climax Industries, Inc.

Joe is best known to the A.W.S. through his activities with the Air Reduction Sales Co. With this company he supervised market, process and product demand surveys and promotion sales activities through sales and service engineering staff of 26 district offices. He collaborated

with displays, conventions and technical society activities. He was concerned with sales-service instruction and promotion meetings, and gave numerous talks before industrial executives and engineering society groups.

Mr. Magrath was associated directly with welded product design as far back as 1917, first with the Budd Wheel Manufacturing Co. on the fabrication of wheel structures for the first world war "quads" (original 4-wheel drive ordnance vehicles); then in 1922 and 1923 on welded steel sash, doors and plate fabrication for the David Lupton Sons Co. During the recent war he was especially active, while with Air Reduction, in the exploration and recording of welding, cutting, brazing and other flame-treatment processing of welded fabrication in all of the larger shipyards on the east, gulf and west coasts as well as other inland war activities plants and various steel mills. Joe has been active in the work of the New York Section of the AMERICAN WELDING SOCIETY and served for several years as Chairman of Publicity and Programs.

It is expected that Joe will bring to the SOCIETY the necessary promotional, educational and inspirational leadership, which will make the SOCIETY better known and appreciated.

His friends in the A.W.S. wish Joe success in his new undertaking. He will have the wholehearted support and cooperation of the present staff members of the A.W.S. who continue in their respective duties.

SOCIETY APPOINTMENTS

Mr. Simon A. Greenberg, by recent action of the Board of Directors, has been advanced from Assistant Technical Secretary to Technical Secretary of the AMERICAN WELDING SOCIETY. He has also been appointed Editor of the *Welding Handbook* and will assume responsibility for issuance of a new edition in the Fall of 1948.

Mr. Greenberg was appointed Assistant Technical Secretary in December 1942 and later served as Acting Technical Secretary. A graduate of the Brooklyn Polytechnic Institute, he has had several years' experience in welding inspection, qualification and design with the Brooklyn Navy Yard, the Philadelphia Navy Yard and in private industry.

METAL EXPOSITION

Slightly more than 90% of the 240,000 sq. ft. of available floor space in Chicago's International Amphitheatre have been reserved for the coming National Metal Exposition, October 18 to 24, 1947.

According to W. H. Eisenman, managing director of the Exposition and secretary of the American Society for Metals, 277 industrial exhibitors have been assigned space in the industry's largest annual exposition. Floor plans had previously been sent only to former exhibitors in the Metal Show. Other companies will receive floor plans on or about July 15th. Because of the unprecedented demand for exhibit space in 1947, it is anticipated that the entire available area will be quickly reserved.

The October Metal Show will mark the first time that the national event has been held longer than five days. Former expositions have opened on Monday and closed on Friday night. The 1947 event, however, will be opened on Saturday, October 18th, and continue until the following Friday night. Thus, two additional days have been added to the Show schedule. Because Chicago is a major center of the metals industries, it is believed that attendance "by invitation only" on the first two days of the event will draw large numbers of interested engineers and technical personnel from the Chicago area. Since annual technical sessions of four major technological societies will open on Monday, October 20th, it appears that most of the out-of-Chicago-area visitors will attend the Exposition during the week of the technical sessions.

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HAYNES hard-facing alloys with greatly improved coatings are now available for metallic arc welding. Use them on your next job to protect metal parts from abrasion, heat, and corrosion.

The registered trade-marks "Haynes," "Haynes Stellite," "Hascrome," "Hastelloy," and "Haystellite" distinguish products of Haynes Stellite Company.

One of These HAYNES Hard-Facing Rods Will Do Your Job

1. HAYNES STELLITE Rods . . . cobalt-chromium-tungsten alloys . . . high in red hardness and highly resistant to abrasion and corrosion.
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3. HASCROME Rod . . . iron-base alloy containing chromium and manganese . . . work-hardens under impact.
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5. HASTELLOY Rods . . . nickel-base alloys . . . resistant to heat and abrasion and highly resistant to corrosion.

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Unit of Union Carbide and Carbon Corporation
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General Offices and Works, Kokomo, Indiana
Chicago—Cleveland—Detroit—Houston
Los Angeles—New York—San Francisco—Tulsa

HAYNES TRADE-MARK *alloys*

The National Metals Exposition, sponsored by the American Society for Metals, will be held concurrently with the National Metals Congress. In addition to the A.S.M., technical meetings during the week will be held by the American Industrial Radium and X-Ray Society, the AMERICAN WELDING SOCIETY, the Iron and Steel Division and the Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers.

The Publications Committee of the American Society for Metals met in Cleveland on July 25th to select the technical papers which will be presented before the Society's annual meeting. Announcements of the program details will be made at a later date.

COLLEGE MEN RECEIVE WELDING AWARDS

The AMERICAN WELDING SOCIETY has presented the cash prizes in the 1947 A. F. Davis Undergraduate Welding Award Program.

The first-prize awards were made at Rose Polytechnic Institute, Terre Haute, Ind., June 5th, at the regular weekly assembly.

John W. Price, a Junior in Mechanical Engineering and the author of the prize-winning paper entitled "Atomic-Hydrogen Arc Welding," accepted his award of $200. Charles J. Bashe, editor of the *Rose Technic* in which the winning article was published, accepted the award of $200 for the magazine. The awards were presented by J. R. Stitt, Research Engineer, R. C. Mahon Co., Detroit, Mich. Mr. Stitt has been a member of the Educational Committee of the AMERICAN WELDING SOCIETY since 1941.

The second-prize awards were made at Cornell University, Ithaca, N. Y., on May 30th in Olin Hall, School of Chemical Engineering, at the student technical society meeting.

Howard Sanders, the author of the prize-winning paper entitled "Welders in Diving Suits," was present to accept his award of $150. Miss Billie Carter, editor-in-chief of the *Cornell Engineer*, which published the winning article, accepted the award of $150 for the magazine. The awards were presented by P. E. Kyle, Chairman of the Educational Committee of the AMERICAN WELDING SOCIETY.

The certificates of award will be presented at the Annual Meeting of the SOCIETY at Chicago in October. At that time Mr. Price will be in a position to accept both his own and the magazine certificates, since he just became editor of the *Rose Technic* for the coming year.

JOHN W. PRICE, JR., WINNER OF A. F. DAVIS UNDERGRADUATE AWARD

Mr. Price was born 26 years ago and reared near East Liverpool, Ohio. He entered Rose Polytechnic Institute at Terre Haute, Ind., in 1938, but lack of finances and the war interrupted his formal education in 1941. In the Army Air Forces Lt. Price was a squadron navigator, leading a B-26 group over the Low Countries and occupied France, flying 63 missions in all. Mr. Price is a student member of the American Society of Mechanical Engineers and of the Rose Student Council and will be graduated in December 1947 with a Bachelor of Science degree in Mechanical Engineering.

John W. Price, Jr.

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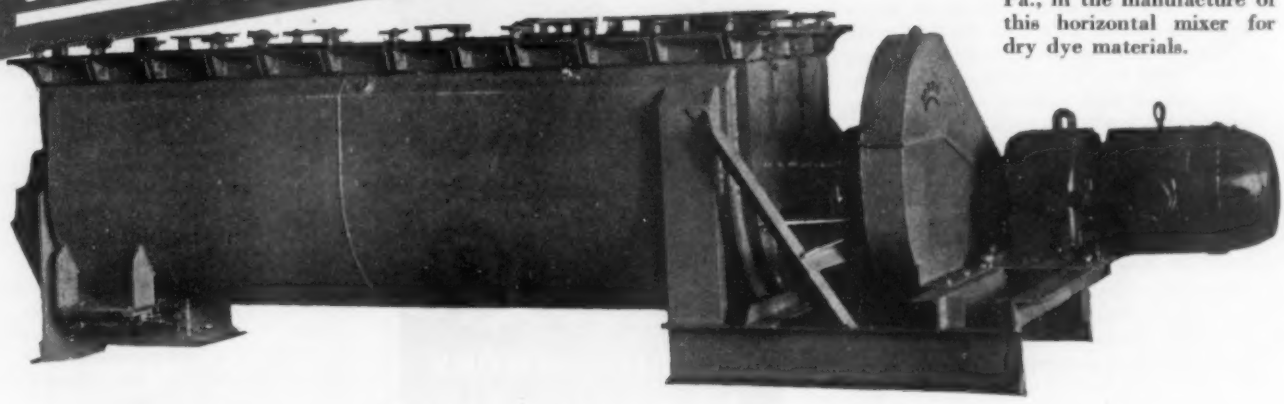

An easily-cleaned, corrosion-resistant Lukens Clad Steel was used by Sprout, Waldron and Company, Muncy, Pa., in the manufacture of this horizontal mixer for dry dye materials.

• You make *two* big savings with Lukens Stainless-Clad Steels—

1. *PROTECTION with economy.* Compared with solid stainless, you can cut material costs as much as 50 per cent. Yet the same corrosion-resistant face is provided, to protect both equipment and products. Heat transfer efficiency is far superior to solid stainless—approaching that of the backing plate, itself.

The stainless may be of any standard type. It is permanently bonded in a *uniform* thickness to any quality of carbon or low alloy steel —from 5 to 50 per cent of total plate thickness.

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SOLID METAL ADVANTAGES WITH CLAD STEEL ECONOMY

Employment Service Bulletin

SERVICES AVAILABLE

A-544. Fourteen years' experience in the development and manufacture of all type electrodes and export sale of electrodes. Ability to weld. Seeking permanent position.

A-548. Welding Supervisor. 10 years as Welding Supervisor, 18 years' Railroad Mechanical experience. Experienced on production of all-welded pressure vessels, locomotive boiler shell, gun carriages, Diesel engine frames, heat exchangers, etc. Materials of mild, low- and high-strength alloy, stainless and chrome steels, copper and copper alloys. Know welding codes, Army and Navy Specs., X-ray work. Experienced on Unionmelt, Automatic operation. Graduate M. E. Knowledge some physical metallurgy. 30 years' service with two large corporations. Desire position with railroad or in welding industry. Available immediately.

A-549. Practical Welding Engineer, no college degree. 28 years in the field supervising production and in charge of inspection. Several years' service as Welding Engineer. Thoroughly experienced all alloys and all processes. Know radiography, both X and Gamma, magnetic powder inspection. Have organized inspection forces. Accustomed to responsibility and authority. Prefer inspection but will consider other. Please give full details in reply.

A-550. Electric Weld Tube Mill Supervisor. 18 years' experience in Steel Tube Industry covering roll design, set-up maintenance, operator training and supervising personnel.

A-551. Resistance Welding Engineer, age 37, three years experience with resistance welder manufacturer. Experience includes research, development, applications, service, and supervision of resistance welding laboratory. Excellent knowledge of all resistance welding processes and equipment. B. S. degree.

OLD TIMERS' NIGHT AT LOS ANGELES

First row (left to right): Al Fenlason, Chairman-elect, 1947–48, Vice-chairman in charge of program arrangements, 1946–47; C. P. Sanders, Chairman, 1939–40, National Vice-President, Western District, 1946–47; L. W. Delhi, A.W.S. President, 1946–47; Carl Nyquist, A.W.S. Board of Directors, 1919, was one of the Society's founders, Chairman at Cleveland in the early '20's; Dave Bisbee, Retiring Chairman, 1946–47. Previously elected Chairman in 1944, Dave was transferred to Chicago before the expiration of his term of office. Re-elected last year, he piloted the chapter for a very successful term in a year filled with all the tribulations of reconversion.

Second row: M. H. Turner, Secretary-Treasurer, 1932–34; Ben Laulhere, Chairman, 1933–34; C. W. (Bill) Roberts, Chairman, 1940–41; Walter Thomas, Vice-Chairman, 1943–44.

Third row: F. H. Stevenson, Chairman, 1942–43; Turner Smith, Chairman, 1932–33, District Vice-President, 1935; Howard Newby, Vice-Chairman, 1939–40.

Fourth row: Charles Babbitt, Chairman, 1944–45; P. D. McElfish, Chairman, 1938–39, District Vice-President, 1942.

MEETING OF BOARD OF DIRECTORS

A meeting of the Board of Directors of the AMERICAN WELDING SOCIETY was held on July 11, 1947, at the A.S.C.E. Board Room, 33 W. 39th St., New York City, with the following in attendance:

Members: H. O. Hill, Presiding; D. Arnott, R. W. Clark, F. W. Davis, R. S. Donald, O. B. J. Fraser, W. F. Hess, A. B. Kinzel, J. F. Lincoln, H. W. Pierce, H. M. Priest and G. N. Sieger.

By invitation: E. V. David.

Staff: W. Spraragen, S. A. Greenberg and M. M. Kelly.

Amendment of Article XII, Section 7, A.W.S. By-Laws—Nominating Committee

Mr. Priest reported that as now worded, the Article is interpreted by some to mean that the Past-President and Chairman of the Committee shall be a member of the Board. This has led to the necessity of frequently calling upon the few available past-presidents. On recommendation of the By-Laws Committee Chairman, the following revision of Article XII, Section 7, was approved by the Directors:

"*Nominating Committee*—A Nominating Committee consisting of seven members. The Committee shall consist of a Chairman, who shall be a Past-President of the SOCIETY, and who may or may not be a member of the Board of Directors, and six members (not members of the Board). Announcement of the appointment and personnel of the Committee...."

Third Printing of 1942 Edition of Welding Handbook

The *Handbook* Editor was authorized by the Board of Directors to proceed with the printing of 2000 cloth-bound copies of the 1942 edition of the *Welding Handbook*.

Publication Committee's Recommendations

In behalf of the Finance Committee, Chairman Fraser reported that the Committee, after studying recommendations of the Publication Committee for obtaining additional revenue for the SOCIETY from THE WELDING JOURNAL, voted to submit them to the Board of Directors for acceptance. The recommendations are as follows:

That the advertising rates of THE WELDING JOURNAL, effective January 1, 1948, be increased to $140 per year for the 12-insertion rate, with corresponding increases in the other rates;

That the Society grant a commission of 15% to advertising agencies and allow a 2% discount for cash payment for JOURNAL advertising;

That the annual subscription price of the JOURNAL be maintained at $5.00 during the drive for new subscribers.

The Board voted acceptance of the Publication Committee's recommendations for increasing JOURNAL advertising rates, allowing an agency commission of 15% and a 2% discount for cash payment, for JOURNAL advertising.

Revision of National Board of Fire Underwriters Ruling Governing the Use of

This special "Y" combines two 10-inch, standard weight, long radius welding elbows—TUBE-TURN Part No. 1, immediately available everywhere.
15" R
120° ± 1/2°

"A speedy, simple, satisfactory answer".

MANY'S the time when a long delay in getting a special fitting seems unavoidable. Many's the time when that fitting can be fabricated from TUBE-TURN Welding Fittings out of stock and give you the right answer—"speedy, simple, satisfactory."

The "Y" diagrammed above was put together with standard TUBE-TURN welding fittings, shown in Tube-Turn Catalog No. 111, and taken out of regular stock. This gave the designer what he needed when it was needed, in a hurry.

TUBE-TURN welding fittings are particularly suitable for piping fabrication because of the uniform wall thickness and full circularity which allows them to be cut and joined at odd angles, and because of uniformity from fitting to fitting. Order two, a hundred, or a thousand TUBE-TURN welding fittings of the same size and part number, and they will be dimensionally alike.

TUBE-TURN welding fittings and flanges are manufactured in more than 4000 types and sizes. They come in a wide variety of metals and alloys. For details, contact the nearest TUBE-TURN distributor. For his name, write to—

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TUBE-TURN TRADE MARK **tt** *Welding Fittings and Flanges*

Welding in Installation of Sprinkler Systems

Cognizant of the fact it may not be possible to bring about an immediate revision of Article 521 (c), that would be satisfactory to the welding industry, it was the opinion of the Board that the following rewording of Article 521 (c) should be proposed for consideration by the N.B.F.U.:

"All inside piping shall be installed by means of screwed or flanged fittings, by welding, or by other approved means. Where welding or other hot work is done in the field, suitable precautions shall be taken to safeguard against fire."

The matter was referred back to the A.W.S. Committee on Safety Recommendations, with request that every effort be made to have the N.B.F.U. Article 521 (c) reworded as recommended by the A.W.S. Board of Directors.

In response to inquiry as to whether the SOCIETY is doing everything possible to eliminate unreasonable restrictions against welding, the Technical Secretary stated that the SOCIETY, through its Technical Department, has been, and is doing, all in its power to eliminate unreasonable restrictions against welding, not only in existing standards, but also is endeavoring to avoid inclusions of such restrictions in standards in preparation. He cited as examples, work that has been done in connection with building codes of cities and municipalities in the U. S., and work with the Railroad and Highway Associations.

Appointment of Executive Secretary

The Committee appointed to secure candidates for the position of Executive Secretary of the SOCIETY, solicited candidates and recommendations from all the Sections of the SOCIETY. It also sought candidates from the Engineering Societies Personnel Service and by wide solicitation for suggestions from the members of the Board of Directors and by individual contacts with members and others.

The Committee considered twenty-eight candidates for this position. Some of this group declined to be considered for the position. Others were considered unsuitable, others found new business connections during our period of consideration which caused them to withdraw their names. It finally presented two men whom the Committee believed are suitably qualified for the position and both are available at this time. It was decided to present these two candidates in person to the Board of Directors for their selection.

The two candidates were thoroughly discussed. Finally, a ballot was taken with the following result. J. G. Magrath was selected as first choice.

The Special Committee was not ready to report regarding suitable by-law revisions to cover the employment of an Executive Secretary. It was, however decided to make no changes in the by-laws at this time, but to leave this matter in the hands of the Special Committee who should confer with the new Executive Secretary and with the By-Laws Committee and to offer to the Board of Directors suggestions for by-law revisions only when such seem to be necessary.

Date Next Board Meeting

Thursday, September 18, 1947, was selected for the next meeting of the Board of Directors.

NEW HEIL SUSTAINING MEMBERSHIP

The Heil Co., with general offices at 3000 W. Montana St., Milwaukee 1, Wis., was founded by J. P. Heil, now chairman of the Board, in 1901 and now employs about 3000 people and has plants covering 52 acres. Joseph F. Heil (son of J. P. Heil) is President of the company. The New Sustaining Membership is the name of Arnold F. Meyer.

The Heil Co. manufactures a wide range of diversified products serving over 125 different types of business and industry. These products include milk and petroleum transport tanks, dump bodies and hoists, road machinery, milk and beverage bottle washers, farm crop dehydrating plants and automatic home heating units. The one common denominator for all of these products is welding and the company has pioneered in the development of many new methods and techniques.

National

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IN THE RED DRUM

EFFICIENT

ECONOMICAL

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FOR WELDING and CUTTING

Use National Carbide in the Red Drum

Write us for information as to nearest available stock.

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Cost of Heater Tank Cut 25% by Welded Design

BY C. E. PULLUM,
VICE PRESIDENT IN CHARGE OF PRODUCTION
BELL & GOSSETT CO., MORTON GROVE, ILL.

One of the principal parts of the domestic hot water system manufactured by our company is the tank shown in Fig. 1. We formerly purchased this tank . . . the design shown at the right . . . from an outside source. Difficulty in getting deliveries led us to redesign it for arc welded steel construction and fabricate it ourselves. The welded design is shown on the left in Fig. 1.

The former casting weighed 90 lbs. The welded tank weighs only 40 lbs.; hence, is easier to handle and install. Reduction in cost of the tank only (exclusive of coils and fittings) has been about 25%.

SIMPLIFIES PRODUCTION

Procedure for making the welded tank, which is 29½" high and 7⅝" in diameter, is very simple. The tank shell is a sheet of 10-gauge steel which is rolled and then butt-welded with one pass of "Fleetweld 5" electrode, 3/16-inch size.

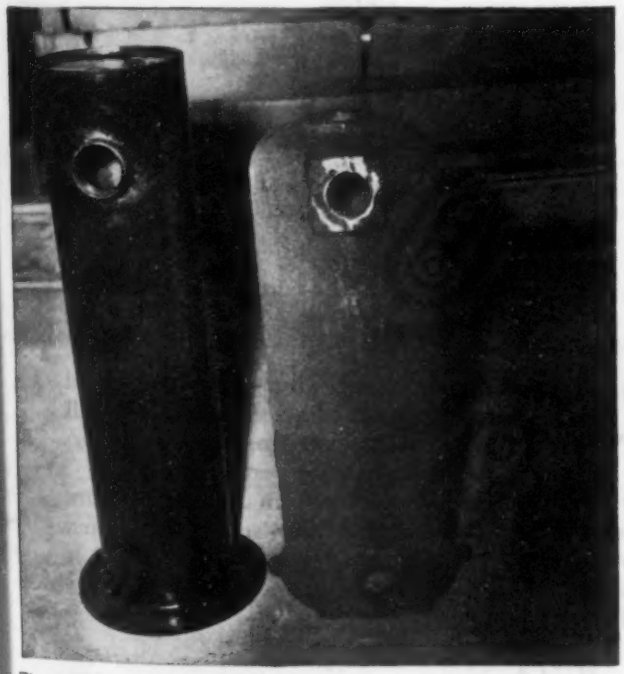


Fig. 1. Tank of new welded design (left) and former design. Changeover to welded construction improved the tank and cut its cost 25%.

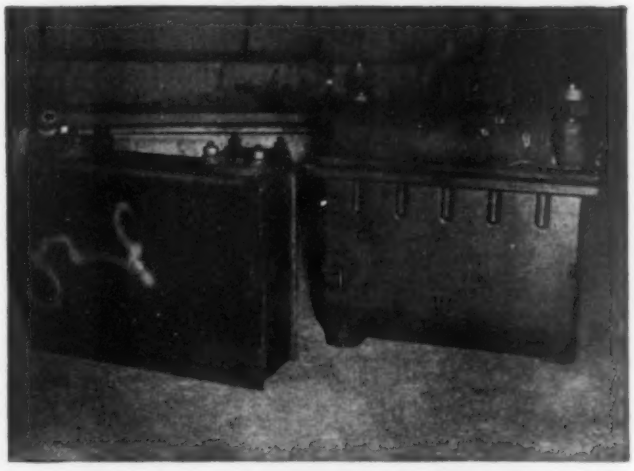


Fig. 2. Tankless heater of welded construction (left) costs about 25% less than the previous construction (right). Its size and weight also have been reduced.

Bottom flange of the welded tank is a ⅜" plate, cut to 10½" diameter. A piece 7⅝" in diameter is cut from the center of this plate and used for the top of the tank. This top plate is cut out with a 5-degree bevel to obtain 100% penetration when it is welded. It is pressed into the top of the tank and welded with one pass of "Fleetweld 5," ¼-inch size. The bottom flange is fillet-welded with the same electrode and a pipe connection welded in as shown.

TANKLESS HEATER ALSO REDESIGNED

Another unit which has been changed over to welded design is a tankless heater. Fig. 2 shows the new welded design (left) and the tank of former construction. Its size, weight and cost have been reduced. Formerly it weighed 105 pounds and was 20" x 17" x 6", exclusive of flange. The welded design weighs 84 pounds and measures 18" x 14" x 6". Cost savings are about 25%.

This tankless heater is fabricated from two pieces of brake-formed 3/16" plate and is fillet-welded with "Fleetweld 5," ¼-inch size.

In exploring for savings with arc welding, we have found it wise to change over one part at a time rather than try to redesign the entire product at once.

The above is published by LINCOLN ELECTRIC in the interests of progress.
Machine Design Sheets are obtainable by writing The Lincoln Electric Company, Dept. 129, Cleveland 1, Ohio.

POWELL HONORED

A luncheon was given to honor Raymond E. Powell, manufacturing engineer at the Western Electric Kearny Works, on July 30, at the Newark Athletic Club. It marks his 25th company anniversary.

A specialist on welding, brazing and soldering, Mr. Powell holds many patents along these and allied lines, and has written numerous welding articles which have appeared from time to time in technical magazines. He is one of the organizers and a past chairman of the New Jersey Section of the AMERICAN WELDING SOCIETY, one of the largest sections in the United States. He has been a member of the A.W.S. for the past 20 years, ten of which he has been a member of the Program Committee for the Annual Meeting.

R. E. Powell

Mr. Powell has held engineering assignments at the Kearny Works since 1927. He came here from the company's Hawthorne Works, Chicago, where he started shortly after he was graduated from the University of Missouri with a bachelor of science degree in electrical engineering. He is a member of the Stanley S. Holmes Chapter of the Telephone Pioneers.

NEW SUSTAINING MEMBER

The General Iron Works Co., Denver, Col., manufacturing division of The Stearns-Roger Mfg. Co., who are engineers, designers and fabricators of oil refineries, sugar processing equipment and mining and power machinery, have appointed M. R. Nelson as their second Sustaining Member. This Company has a completely modern plate, forge and machine shop; facilities for pressure vessels, built to A.S.M.E. and A.P.I.-A.S.M.E. Code requirements, and other steel fabrication, including automatic welding, x-ray and stress relieving equipment. Mr. Nelson is Metallurgist in charge of laboratory and testing.

SPICER MANUFACTURING ADDS SUSTAINING MEMBER

Spicer Manufacturing, Div. of Dana Corp., Toledo 1, Ohio, has taken out a Sustaining Membership in the name of Carl F. Ostrosky.

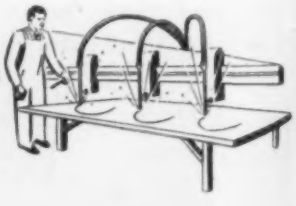
At the Toledo plant this company manufactures automotive products such as front and rear axles for the Willys Jeep, drop gear auxiliary transmissions for driving the front wheels and rear axle of above jeep; passenger car rear axles, universal joints for trucks and heavy bus installations, joints for "PT" boats, large aircraft and marine installations, railroad generator drives for Pullman coaches, truck and bus transmissions, Torque Convertor type of transmissions for passenger coaches or busses, power clutches for transmissions, and Industrial applications, also power take-offs and auxiliary type transmissions for large and heavy power-driven trucks and tractors for hauling heavy loads in mountainous regions.

FOR THESE JOBS . . .

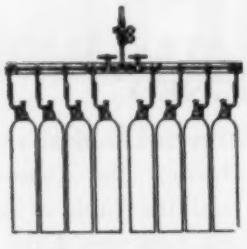
Production Welding

. . . and operations such as welding and cutting heavy sections with hand torches, flame hardening and softening, flame cleaning . . . also any installation where a battery of cylinders is required.

Production Cutting

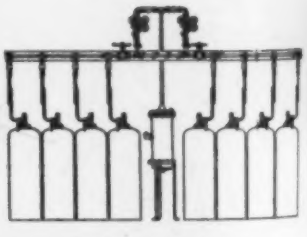


YOU NEED THESE MANIFOLDS . . .



RegO Oxygen Manifold

RegO Acetylene Manifold



BECAUSE OF THESE ADVANTAGES...

● ***Added Convenience***... Individual shut-off valves at each cylinder station permit the removal of any cylinder without shutting down one side of the manifold. Master shut-off valves control flow of each bank of cylinders.

● ***Unit Construction***... Header assembly, mounted to steel I-beam, is virtually one piece. Extra-heavy pipe is run through header fittings, cylinder station shut-off valves and master shut-off valves with all permanent connections silver-brazed.

● ***Precision Regulation***...Uniform delivery pressure is assured by large capacity two-stage Regolators.

● ***Exacting Tests*** . . . Every RegO Manifold is subjected to a sustained air pressure test before shipment.

REGO

RegO Manifolds for Oxygen . . . Acetylene . . . Hydrogen . . . Nitrogen and other high pressure gases

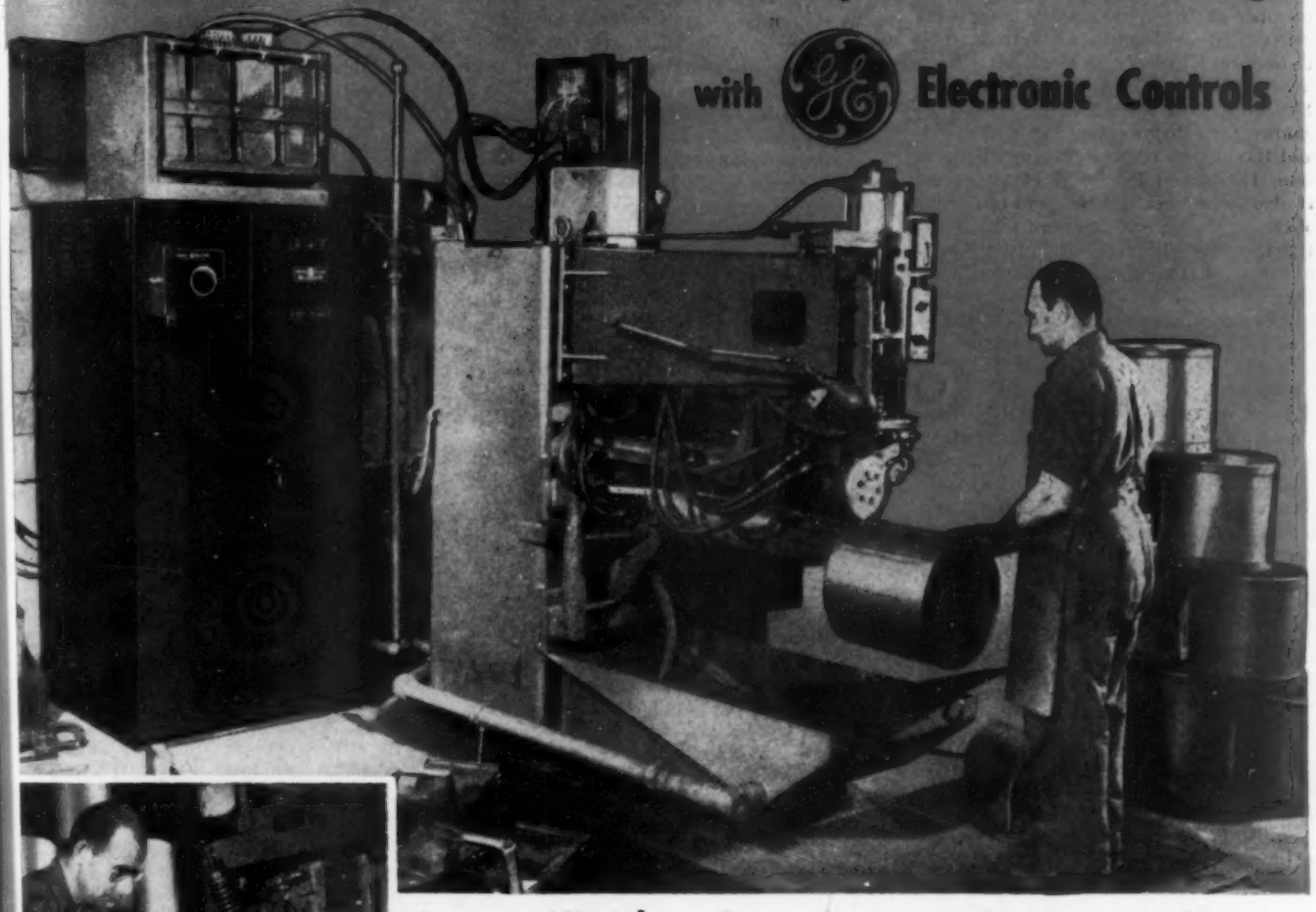
There Is A RegO Manifold to Fit Your Most Exacting Requirements

The BASTIAN-BLESSING Company

4201 W. Peterson Avenue Chicago 30, Illinois

Pioneer and Leader in the Design and Manufacture of Precision Equipment For Using and Controlling High Pressure Gases

PRODUCTION TRIPLED by Resistance Welding with G-E Electronic Controls



By shifting from acetylene welding to resistance welding with G-E controls, Tarrant Manufacturing Co., Saratoga Springs, N. Y., has tripled their production of road maintenance equipment.

Actual increase in production rate is even greater. It took three minutes to acetylene weld the bottom seam of the roofer's bucket pictured above; now, it takes 20 seconds. G-E controls assure automatic and accurate timing of the welding cycle; thus, faster, more consistent welding.

Large Welder Operates on Low-capacity Power Lines . . . Thanks to Series Capacitors

No Large Voltage Drop . . . Unity Power Factor

This large welder operates on low-capacity power lines, with no large voltage drop, thanks to G-E series capacitors. They reduce the normal welder demand from 100 kva to 40 kva, and correct the power factor to unity. There is no light flicker in the plant or surrounding residential area. For details on series capacitors, ask for Bulletin, GET-1134.

New Lines of Synchronous and Nonsynchronous Controls

1. Control is factory-assembled in one, easy-to-install cabinet.
2. Easy servicing through large side door of cabinet.
3. Control station always faces operator.

For further details, ask for Bulletins GEA-4699 and GEA-4726.

HAVE YOU SEEN

"This Is Resistance Welding", G.E.'s 30-minute, full-color movie? Your nearest G-E office, local utility, or resistance welder manufacturer representative will be glad to arrange a free showing.

GENERAL ELECTRIC

Apparatus Department, Sec. C645-43
General Electric Company
Schenectady 5, New York

Please send me the following bulletins:

- ☐ GEA-4699, Synchronous Precision Control for Spot and Projection Welding
- ☐ GEA-4726, Nonsynchronous Control for Spot and Projection Welding
- ☐ GEA-4571, The Importance of Control
- ☐ GET-1134, Application of Series Capacitors to Resistance Welding Machines

Name.....

Company.....

Address.....

JOSEPH F. SCOTT BECOMES CLASS A MEMBER

Joseph F. Scott has become a sustaining member of the AMERICAN WELDING SOCIETY. He is Deputy Commissioner of Labor and Chief of the Mechanical Engineers' Bureau of the State of New Jersey, Department of Labor. This Bureau includes the Engineers' License Division and the Certification of Steam, Refrigeration, Diesel and Power Plant Operators. It also includes installation and inspection of Steam Boilers and Pressure Vessels and Refrigeration Plants. Mr. Scott is a member of the A.S.M.E. Boiler Code Committee. He is also a member of the Conference Committee of the A.S.M.E. Boiler Code Committee representing the State of New Jersey, appointed by the Governor of New Jersey in 1919. Mr. Scott is a member of the A.S.R.E. Code Committee representing International Association of Industrial Accident Boards and Commissions appointed by the United States Department of Labor in 1921. Mr. Scott is the second Sustaining Member enrolled in the AMERICAN WELDING SOCIETY by the National Board of Boiler and Pressure Vessel Inspectors.

SUSTAINING MEMBER

The Babcock & Wilcox Co., Barberton, Ohio appointed a second Sustaining Member to the A.W.S. with Otis R. Carpenter, Welding Engineer as the representative.

At its Barberton Works the Company manufactures water tube steam boilers, both stationary and marine, pulverized-coal equipment, water-cooled furnaces, steam superheaters, economizers, air heaters, chain-grate stokers, refractories and process equipment. A subsidiary, The Babcock & Wilcox Tube Co., manufactures seamless and welded tubes and pipe of steel and alloys. Other plants are located at Beaver Falls, Pa., Augusta, Ga., and Alliance, Ohio.

INDEX TO 1946 A.S.T.M. STANDARDS

The "Index to A.S.T.M. Standards," as of December 1946 was issued in June 1947, and is really an adjunct to the *1946 Book of Standards* and enables any of the some 1400 standard specifications and tests in the volumes to be located readily. The Index is also of service to those who wish to determine whether A.S.T.M. has issued standard specifications, test methods or definitions covering a particular engineering material or subject.

All items are listed in the Index under appropriate key words according to the particular subjects they cover. As a convenience, a list is given of the specifications and tests in numerical sequence of their serial designations.

Copies of the 242-page publication are furnished without charge on written request to A.S.T.M. Headquarters, 1916 Race Street, Philadelphia 3, Pa.

MATERIALS HANDBOOK

Materials Handbook, an encyclopedia for purchasing agents, engineers, executives and foremen, by George S. Brady, Price $6.00, is published by the McGraw-Hill Book Co., Inc. This book of 831 pages is divided into two parts. The first part deals with Materials: Their Properties and Uses. The materials are arranged alphabetically. In effect this also becomes a dictionary of important materials used in engineering work. The second part is entitled "Elements of Materials Economics." It has an interesting section on Geophysics of Materials, Nuclear Physics, Geology, Plant and Animal Production and materials relative thereto, as well as other useful tables.

AIRCO ANNOUNCES REPRINT OF ARTICLE ENTITLED "OXYACETYLENE CUTTING IN SHEET METAL WORK"

Air Reduction Sales Co. recently announced the availability of a 12-page reprint of an article entitled "Oxyacetylene Cutting in Sheet Metal Work" which appeared in recent issues of *Sheet Metal Worker*. The article, written by R. F. Helmkamp, Airco's flame cutting specialist, is illustrated with 22 photographs and line drawings.

The first half of the article covers fundamentals of machine gas cutting, equipment needed and cost of operation. The last half concerns itself with specific shop applications of the process such as stack cutting. Reference is also made to Airco's new Flux-Injection Method for cutting stainless steel.

Copies may be obtained by writing Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y., or the Airco sales office nearest you.

NEW ACCESSORIES CATALOG

Metal & Thermit Corp., 120 Broadway, New York City, has just issued a new bulletin describing a complete line of welding accessories that will be carried in stock at each of their district offices.

These accessories, along with their extensive line of electrodes for arc and gas welding, permit their customers to get everything in the welding line, with the exception of the welding machine, from one source.

Copies of the bulletin are available upon request.

WELDING CATALOG

The new catalog of Victor Equipment Co., 844–54 Folsom St., San Francisco, is colorful and interesting. It shows in four color illustrations a comprehensive portion of the large line of Victor gas welding and flame cutting apparatus.

GOLDEN HORIZONS

Technical societies and industrial plants looking for an outstanding industrial film to show before technical groups are invited to book "Golden Horizons," a 16-mm., 33-min. film in sound and color. "Golden Horizons" tells of the development of copper-base alloys from prehistoric days and shows its importance in modern industry. The film is furnished without charge, user paying transportation charges one way.

For bookings address Ampco Metal, Inc., Milwaukee 4, Wis.

FOR SALE

STAINLESS STEEL WELDING ELECTRODES

25/20 Type #310

In Original Cartons.

20,000 lbs. 3/16" Diameter — "Harnischfeger" Mfr.
20,000 lbs. 3/16" " — "A. O. Smith" Mfr.
20,000 lbs. 1/4" " — "A. O. Smith" Mfr.

Price:—25¢ per lb. — Minimum order of 500 lbs., f.o.b Philadelphia, Pa.

J. A. DOUGHERTY

156 VASSAR ROAD BALA-CYNWYD, PA.

TIP CLEANING DRILLS

Mounted in Knurled

BRASS Handled

LARGE STOCK
PROMPT DELIVERY
NO RATING REQUIRED

DISTRIBUTORS WANTED

NEW MEXICO STEEL CO.

Box 691, Albuquerque, N. M.

Two lengths of an Alcoa Aluminum extruded shape are flash-welded into a single side rail for an Alsco aluminum combination storm window. The welds are made rapidly . . . more than 500 per hour. The joint is sound and strong . . . practically equal in tensile strength to the parent metal—cleanup is held to a minimum. And . . . the cost per weld is low.

The aluminum alloys are readily welded by the flash-weld method. Machines are readily set and adjusted to handle aluminum tubing, extruded shapes, sheet, and bars.

Full information on the use of flash-welding on Alcoa Aluminum is given in the booklet "Welding and Brazing Alcoa Aluminum". Ask your nearby Alcoa Sales Office for a copy. Or write to ALUMINUM COMPANY OF AMERICA, 1933 Gulf Bldg., Pittsburgh 19, Pa. Sales offices in 55 leading cities.

MORE PEOPLE WANT **MORE** ALUMINUM FOR **MORE** USES THAN EVER

ALCOA

ALCOA ALUMINUM

IN EVERY COMMERCIAL FORM

SECRETARY GEORGE C. MARSHALL TO BE HONORED BY A.S.M.E.; HENRY FORD II WILL ADDRESS ANNUAL MEETING; OTHERS NAMED FOR MEDALS AND AWARDS

Secretary of State George C. Marshall has been elected to honorary membership in The American Society of Mechanical Engineers, it was announced recently by Clarence E. Davies, Secretary of the society, at national headquarters in the Engineering Societies Building, 29 W. 39th St., New York City.

In a letter to Eugene W. O'Brien, of Atlanta, Ga., president of the engineering society, Secretary Marshall formally accepted the honor and said that if his other commitments allow, he will attend the annual dinner, to be given on the evening of December 3rd in Atlantic City, to accept the award in person.

Henry Ford II, president of the Ford Motor Co., Detroit, will be the speaker at the dinner. His subject has tentatively been announced as "Greater Production for Peace." The dinner will feature the 68th Annual Meeting of the Society, December 1st to 5th in Atlantic City, the first one to be held outside of New York.

Other Honors Announced

Three others have been named to receive honorary memberships at that time. They are:

Dr. Harvey N. Davis, president of Stevens Institute of Technology, a past-president of the A.S.M.E., formerly director of the office of production research and development of the War Production Board.

Francis Hodgkinson of New York, retired consulting engineer, who was connected with the Westinghouse Electric Corp. from 1896 until 1936, a former vice-president of the A.S.M.E. and its Holley Medalist in 1938.

Everett G. Ackart, of Wilmington, Del., retired, formerly chief engineer of E. I. du Pont de Nemours and Co., Wilmington.

Lord Dudley Gordon, president of the British Institution of Mechanical Engineers, and noted English authority on refrigeration, received a similar honor earlier this year, in London.

Medalists Are Named

Medals and prizes for 1947, to be conferred at the Annual Meeting, have been announced as follows:

The A.S.M.E. Medal, highest honor of the engineering society, to Paul W. Kiefer of New York, chief engineer, motive power and rolling stock, New York Central Railroad.

Holley Medal to Raymond D. Johnson, hydraulic engineer, retired, Fort Lauderdale, Fla.

Worcester Reed Warner Medal to Arpad L. Nadai, consulting engineer, Westinghouse Research Laboratories, East Pittsburgh, Pa.

Melville Prize Medal to Raymond C. Martinelli of the general engineering and construction laboratory, General Electric Co., Schenectady, for an original paper on "Heat Transfer to Molten Metals."

Northrop to Receive Aviation Prize

At the Fall Meeting of the society, to be held in Salt Lake City, September 1st to 4th, the Spirit of St. Louis Medal, given every third year "for meritorious service in the advancement of aeronautics," will be awarded to John K. Northrop, president and chief engineer of Northrop Aircraft Corp., Hawthorne, Calif.

AMPCO ISSUES PROCEDURE SHEET ON WELDING DISSIMILAR METALS

How to weld dissimilar metals is fully described in a welding procedure sheet just issued by Ampco Metal, Inc., Milwaukee 4, Wis., entitled, "Ampco Procedure for Welding Dissimilar Metals."

The discussion covers the use of Ampco welding electrodes—Ampco-Trode 10 and Phos-Trode Electrodes—and gives in detail information concerning selection of electrodes, recommended amperage and voltage procedures, necessary heats, polarity and current requirements and similar data.

Typical base metals which may be welded include brass, bronze, coppersheet, malleable iron, cast iron and nickel alloys.

Copies will be sent on application to Ampco Metal, Inc., Milwaukee, Wis.

ALLAN B. KIME JOINS RANSOME MACHINERY COMPANY

Ransome Machinery Co., a subsidiary of Worthington Pump and Machinery Corp., has recently appointed Allan B. Kime as Eastern Regional Manager in charge of the sale of Ransome Positioning and Turning Roll Equipment.

An electrical engineer, Mr. Kime has had extensive experience in both the production and sales end of the welding field, having been associated for the past twelve years with the Federal Shipbuilding and Drydock Co., Kearny, N. J., in supervisory capacity in charge of welding production methods and procedures. He was formerly Sales Engineer in the New York metropolitan district for both the Century Electric Co. and the Lincoln Electric Co., and has been a member on the executive committee of the New Jersey Section of the AMERICAN WELDING SOCIETY.

Mr. Kime's Eastern Regional Headquarters will be at the Ransome Plant, Dunellen, N. J. He will spend most of his time with Ransome distributors and customers, assisting them in the recommendation and application of Ransome's complete line of welding positioning equipment.

WELDING CONNECTORS

Saxe System Welded Connection Units for welded assembly

Saxe Units place in position and securely hold together structural parts to be welded.

As used in many welded structures they *eliminate all hole punching*, producing an economical, rigid, safe and quickly erected structural frame.

Write for descriptive literature

J. H. Williams & Company
Buffalo 7, New York

G. D. Peters Company
Montreal 2, Canada
Canadian Representatives

Time Counts—
Gas cut and Weld with

Shawinigan Carbide

SHAWINIGAN

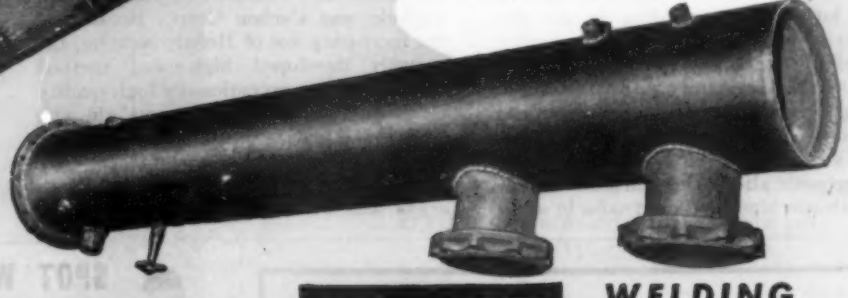
SHAWINIGAN PRODUCTS CORPORATION
EMPIRE STATE BUILDING, NEW YORK 1, N.Y.

For Industrial Fabrication —with 3/16" AP it isn't necessary to change electrodes when welding from downhand to vertical or to overhead work. You get fast, sound welds in *any* position.

On Construction Work — AP, in this one size, welds in all-positions. It means far fewer electrode changes . . . fewer danger-making moves. You can weld faster, and get better welding.

For Tack Welding — AP is the perfect electrode. It eliminates "hump" troubles with deep, flat, spot penetrations.

For Pipe Welding — 3/16" AP saves time and space over other fabrication methods. Use it for pipe, fitting and boiler work — profit by its deep-penetrating, spray-type arc, its smooth, fast welds.



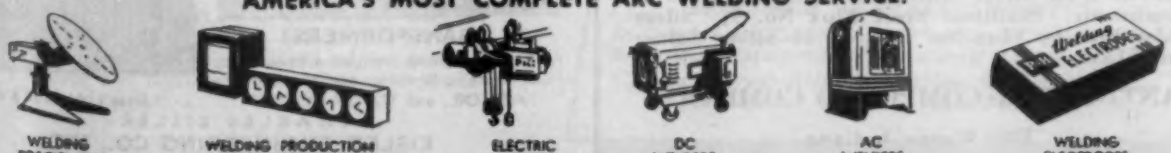
Your P&H REPRESENTATIVE has AP

P&H makes a production-proved electrode for every welding requirement: for all mild, alloy and stainless steel applications, cast iron and for building up and hard surfacing.

P&H **WELDING ELECTRODES**
4551 W. National Avenue,
Milwaukee 14, Wis.

HARNISCHFEGER
CORPORATION

AMERICA'S MOST COMPLETE ARC WELDING SERVICE.



WELDING POSITIONERS · WELDING PRODUCTION CONTROL SYSTEMS · ELECTRIC HOISTS · DC WELDERS · AC WELDERS · WELDING ELECTRODES

HARD-SURFACING ELECTRODE

A new electrode for hard-surfacing applications where resistance to impact, wear and abrasion is required has been announced by the Electric Welding Division of the General Electric Co. Designated Type W-94, the new electrode will work harden to over 50 Rockwell C. It operates on a.-c. or d.-c. reverse polarity.

W-94 is available in 14-in. lengths, with diameters of 1/4, 3/16, 5/32 and 1/8 in. It is packaged in 50-lb. standard packages, and can be shipped from stock.

THIRD EDITION OF "LESSONS IN ARC WELDING"

The third edition of *Lessons in Arc Welding* published by The Lincoln Electric Co., Cleveland, Ohio, has been so completely revised that it amounts to almost an entirely new book. It is designed to assist both beginners and experienced welders as well as all persons interested or concerned with the subject, with complete and thorough instructions in all phases of arc welding. While previous editions have been widely used as texts in trade and vocational schools as well as private welding schools, it is felt that the new material will greatly widen its distribution.

The book includes 58 lessons and has 228 photographs, illustrations and drawings to supplement the text. A valuable feature is the "Questions and Answers" contained in the last thirty pages. The questions and answers are separate, and are both separated from the text, which makes it easy to use this section for quizzes and self-examination. The book sets forth in simple language the practical instruction based on the experiences of Arthur Madson, head instructor in the Lincoln Arc Welding School. Under Mr. Madson's direction, over 30,000 students have gone through this school to become practical, successful arc-welding operators.

Published with the objective of aiding those interested in welding to use the process successfully and economically, *Lessons in Arc Welding*, third edition, explains the fundamentals of this method of joining metals by the fusion principle and incorporates a wealth of new information such as complete treatment covering welding with alternating current, including both machines and electrodes in addition to the lessons on d.-c. welding; new procedures covering large electrodes with recommendations as to their use; newest electrodes and their use; a number of lessons on pipe welding; and data on the qualification of welding operators. A feature of interest to all is the complete discussion of distortion with recommendations regarding its prevention and control. An added feature is Lesson 47 containing a complete description of the principles of hard-facing.

The book, consisting of 158 pages, 5 1/2 x 8 1/2 in., is mailed postage prepaid anywhere in the United States for 50 cents per copy, 75 cents elsewhere. The cover is of semiflexible simulated leather, gold embossed.

HELIARC WELDING

A catalog describing the new Miller A.-C. Welders for "Heliarc" Welding is available on request of Miller Electric Manufacturing Co., New Sales Office, Appleton, Wis.

MATERIAL HANDLING EQUIPMENT

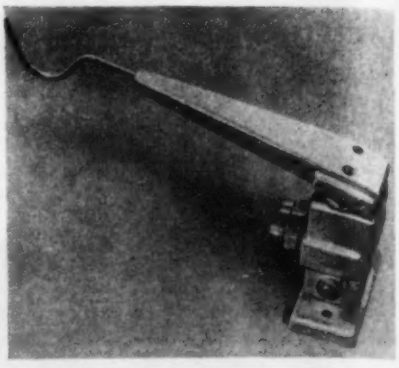
New bulletin describes and illustrates general line of material handling equipment including hydraulically operated lift trucks, pallet trucks, elevating tables, high lift trucks and sheet feeding equipment. The cover is a panorama of typical applications of these products.

Write for Bulletin 201 to LYON-Raymond Corp., 3665 Madison Ave., Greene, N. Y.

VALVE CUTS ARGON CONSUMPTION IN HELIARC WELDING

A new shutoff valve, designed to cut down argon consumption in production Heliarc welding, has been developed by The Linde Air Products Co., Unit of Union Carbide and Carbon Corp. Because of the increasing use of Heliarc welding, the recently developed high-speed method which produces exceptionally high-quality welds in "hard-to-weld" metals, the Oxweld V-30 dual shutoff station valve should find widespread acceptance.

The Oxweld V-30 valve controls both argon and water supply. It is operated



by an extension lever on which the torch is hung when not in use. In Heliarc welding, argon is required only when welding is actually in progress. With this valve the operator merely hangs the torch on the handy hook, and argon and water supply is immediately cut off. A torch weighing as little as 12 oz. will effect a tightly sealed shutoff. When the torch is removed, the valve opens and an instantaneous supply of argon is obtained at the preset flow rate.

The Oxweld V-30 valve is sturdily constructed and requires little, if any, servicing over a period of years. It has a self-sealing type of packing that will operate for long periods without maintenance or leakage. The V-30 is designed for operating pressures up to 100 psi. for both argon and water, although it has been satisfactorily used with pressures over 150 psi. Each valve is supplied with an adjustable base that is easily set for either wall or bench mounting, with the operating lever conveniently placed for hanging up the torch.

ALL-WELDED STEEL TUG

The illustration shows a 45 ft. steel diesel all-welded tug manufactured by the Equitable Equipment Co., Inc., New Orleans, La. The load of displacement is 28 tons. The Shell plating is madeof 5/16 in. steel. It has insulated quarters and pilot house.

Buy "Proven Fluxes" with Years of Guaranteed Satisfaction behind them

The Trade-Name is "ANTI-BORAX"

Ask for Them ***Unequalled for Quality***

A Flux for every metal: Cast Iron Welding Flux No. 1; Brazing Flux No. 2; Braz-Cast Flux No. 4 for bronze-welding cast iron; "ABC" Aluminum Flux No. 8 for sheet Aluminum and all alloys of Aluminum; Stainless Steel Flux No. 9; Silver Solder Brazing Flux No. 10; No. 16 Silver Solder Paste Flux.

ANTI-BORAX COMPOUND COMPANY

Fort Wayne, Indiana

SPOT WELDERS!

OF ALL TYPES SIZES 1/4 TO 300 KVA. FOR MANUAL, AIR, MOTOR OR ELECTRONIC OPERATION also BUTT, ARC, and GUN WELDERS

TRANSFORMERS!

For Furnaces, Lighting, Distribution, Power Auto Phase Changing Welding, and Special Jobs.

AIR, OIL, and WATER COOLED. Sizes 1/4 to 300 KVA.

CHARLES EISLER

EISLER ENGINEERING CO., INC.

779 South 13th St. (Near Avon Ave.) NEWARK 3, N. J., U.S.A.

Service at your elbow

on RAYTHEON WELDING CONTROLS

Non-Synchronous Controls

Junior and Senior Condenser Weldpower Units

High-Voltage Synchronous Controls

Low-Voltage Synchronous Controls

RAYTHEON WELDING CONTROLS built in the well-known "filing cabinet design," are flexible, easy to use, simple to service, tamper-proof and thoroughly accurate and dependable in operation.

In a matter of minutes, any user of Raytheon Welding Controls can secure authorized technical advice on his specific problem. Twenty-one Raytheon Factory Service centers, adequately staffed, are at your service.

Raytheon Factory Service representatives are thoroughly trained to provide expert aid by telephone, correspondence or field service. Even remotely located plants can be reached by air by one or more of these men in a matter of hours.

Write for detailed information on Raytheon Welding Controls

RAYTHEON

Excellence in Electronics

RAYTHEON MANUFACTURING COMPANY

COMMERCIAL PRODUCTS DIVISION

WALTHAM 54, MASSACHUSETTS

Industrial and Commercial Electronic Equipment, Broadcast Equipment, Tubes and Accessories

Sales Offices: Atlanta, Boston, Chicago, Cleveland, New York

INDUSTRIAL WATER TAXI

The above illustration shows all-welded 28 ft. 6 in. industrial water taxi which is standard equipment with the Equitable Equipment Co., Inc. of New Orleans. The vessel is all-welded steel construction including an insulated top. It is excellent for oil and other industries requiring fast, safe, shallow draft water transportation.

WELD ENGINEERING CUTS 33 OPERATIONS TO 5

The bus body pillar shown in Fig. 1 is an excellent example of how a simple design and process change can sometimes produce important savings in production costs, while increasing output and improving quality.

The reinforced pillar, fabricated from 13 separate stampings by Hawthorne Metal Products Co., Detroit, was designed originally for single spot welding. This in itself resulted in a rather low fabricating cost. When the job was released for production, however, the supplier of the welding equipment—Progressive Welder Co. of Detroit—recommended the forming of a series of projections in five of the stampings at the same time that these were produced.

The new stampings were then attached to the pillars by projection welding, using a press-type welder. As a result, only one "weld" was required to join each of these five stampings to the pillar proper, instead of 33 individual spot welds.

Moreover, by using simple locating dies in the press welder it was possible to get accurate locating and alignment without clamping of the parts prior to welding.

The net result of the changes was to double the productivity of the welding equipment—100 completed assemblies being produced per hour in comparison to 50 per hour by straight spot welding. Obviously this also cut the fabricating cost in half.

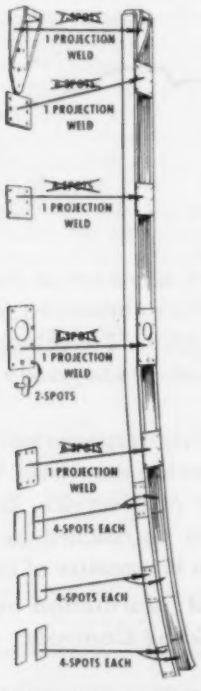


Fig. 1—Reinforced Bus Pillar Designed for Low-Cost Fabricating by Spot Welding and as Redesigned for Still Lower Cost by Using Projection Welding for Five of the Stampings

30-GALLON ALL-ALUMINUM DRUM

Transportation and storage of many chemicals involve the difficult problem of avoiding reaction with the container. Aluminum is a "natural" for such service because it does not react at all with many chemicals. This means the container is immune to attack from its contents and also that the contents are not affected by the container.

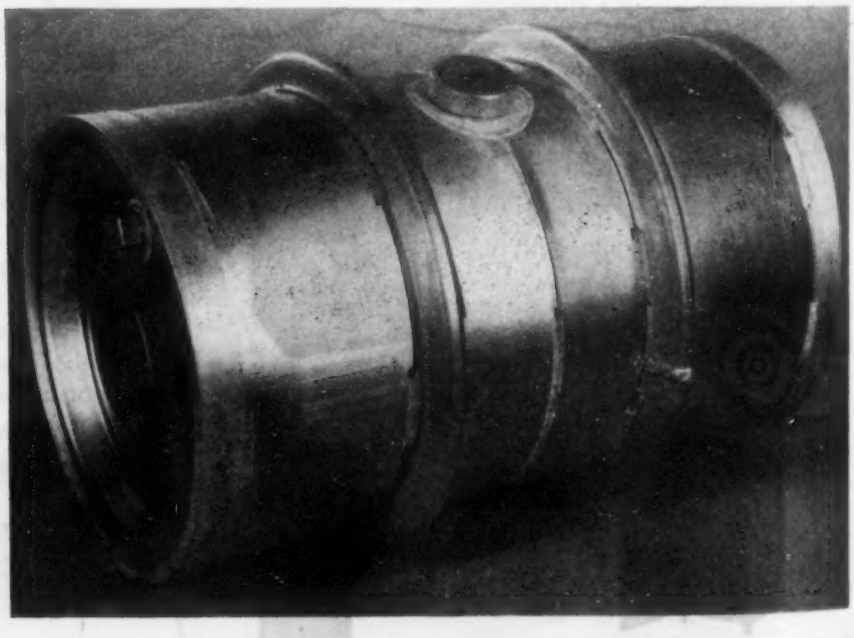
The 30-gallon all-aluminum chemical drum just announced by Reynolds Metals Co., 2000 So. Ninth St., Louisville 1, Ky., was designed specifically for shipping hydrogen peroxide. While this chemical decomposes rapidly in the presence of heavy metal salts, high purity aluminum (99.6% or more) does not affect it. The Reynolds 30-gallon drum meets Interstate Commerce Commission Specifications 42D.

This drum, under most conditions, is also suitable for transporting and storing a wide range of other materials including pharmaceuticals and such chemicals as glacial acetic acid, nitric acid (80% and higher), benzine, ether, as well as vegetable, animal and mineral oils.

Specifications: The Reynolds 30-gallon aluminum drum weighs 34 lb., compared with 65–70 for a steel drum of comparable strength. It is 30 1/2 in. high, 18 in. outside diameter not including reinforcing rings which are 1 1/2 in. high, adding 3 in. to make to total over-all diameter 21 in.

The drum is made from deep drawn halves employing a self-reinforcing design that gives great strength. Each shell is drawn from high purity aluminum stock 0.114 in. thick. After drawing, minimum wall thickness is 0.102 in. The two drawn halves are joined by a circumferential seam weld made on Heliarc automatic equipment.

Reinforcing chime rings at top and bottom give added strength, absorb wear, prevent denting and distortion of the drum. They are made from high-strength aluminum sections, either extruded or roll formed. Extruded sections are 1 7/8 in. high, 1/8 in. thick on the narrow portion tack welded to the outer surface of the

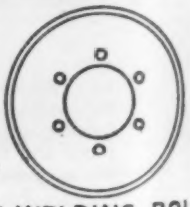


"ELECTROLOY" for RESISTANCE WELDING

Butt
Flash
Spot
Seam
Projection

ELECTROLOY

Catalog and prices on request



OFFSET HOLDER

THE ELECTROLOY CO. INC. 1600 SEAVIEW AVE. BRIDGEPORT, CONN. WELDING ROLL

PAGE *Welding* ELECTRODES

STEP 1 toward better production welding

"Getting in touch with Page" doesn't always mean ordering a shipment of welding electrodes or rods. Sometimes it means getting some up-to-the-minute information on the right size or analysis of rod—the most efficient welding technique—how some other welder has licked the same kind of problem that comes up in your plant.

Your PAGE distributor is a responsible source for all types of electrodes and rods—specializing in PAGE-Allegheny stainless steel. And if he doesn't know the answer to your welding question, he can get the answer from a PAGE Field Service Man. So we say . . .

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shell. Bulb section is $^3/_8$ in. deep, $^5/_8$ in. wide. Roll-formed sections are also same height and thickness ($1^7/_8$ x $^1/_8$).

The rolling rings are strong alloy (R361). Strip 0.128 in. thick is put through roller dies on a continuous roll-forming machine to give the desired section shape. At the same time they are coiled to fit the drum. Individual rings are out from the coil, butt welded and fastened to the drum by a series of fourteen 3-in. long weld beads positioned alternately on one side of the ring and then the other. Top and side fittings are also welded in place.

Each drum is individually pressure tested and given a chemical dip finish.

PRODUCTION OF CONCRETE MIXERS SPEEDED BY ARC WELDING

Production of concrete mixers for huge building projects has been speeded by increased use of arc-welded construction at the Jaeger Machine Co., Columbus, Ohio, world's largest manufacturer of concrete mixers.

Jaeger's new 8-cu. yd. mixer measures 86 in. in diameter and 27 in. in height. It is constructed of four plates of $^1/_4$-in. carbon steel, sheared and formed in the Jaeger plant and welded in a special welding fixture. For added strength, the entire discharge end is double-butt-welded.

By using welded fabrication instead of riveting and bolting, this company has reduced production time for a $4^1/_2$-cu. yd. truck-mounted mixer by 50%. More than 70 hr. of welding time, involving ten operations in four welding fixtures, are required to complete this mixer. All seams are double-butt-welded for added strength.

Water for this mixer is provided by a 200-gal. tank made of $^1/_8$-in. steel plates. Clamps are used to hold the plates in position during welding. Through careful positioning, 90% of this welding is horizontal, the remainder being vertical. Each tank is subjected to 125 lb. of water pressure as a check against possible leaks.

PULLMAN-STANDARD'S NEW BOX CAR AT THE CAPITAL

Pullman-Standard Car Manufacturing Company's latest creation in railroad box cars, the model P-S-1 was displayed to government and railroad officials, and members of Congress, in Washington recently. The car was exhibited at the special invitation of Col. J. Monroe Johnson, Director of the Office of Defense Transportation.

Termed "the box car in a package" because it aims at standardization in the box car field, the P-S-1 is already on the production lines at the Pullman-Standard's Michigan City plant. More than 10,000 are on order to help relieve the box car shortage.

Annual Meeting, Chicago

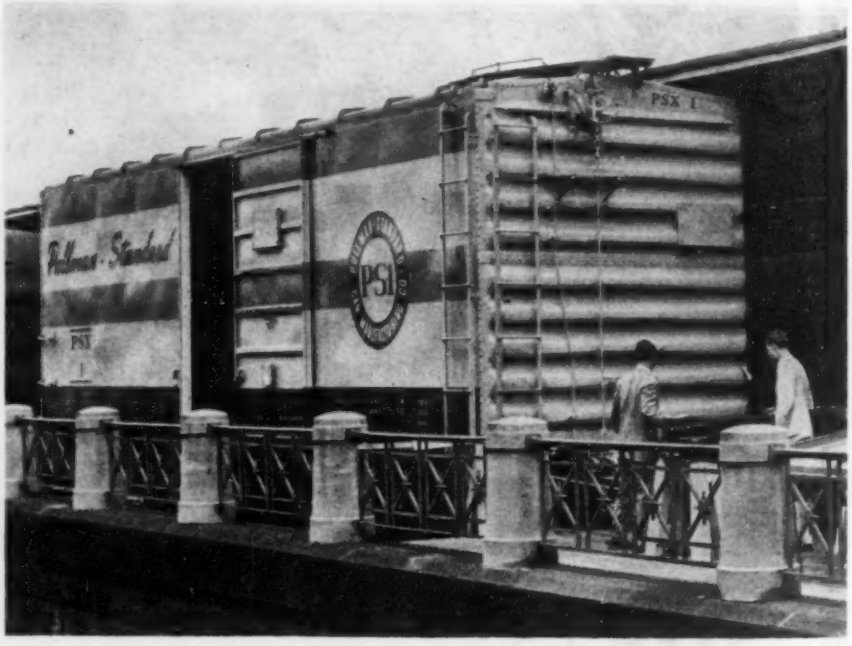
Hotel Sherman

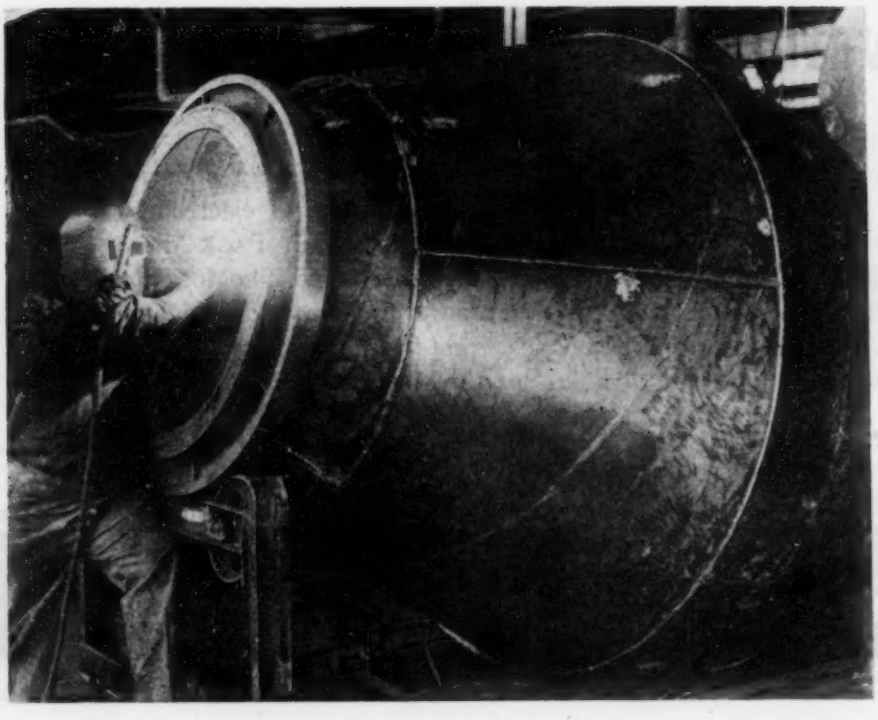
Oct. 19-24

Metal Exposition

Chicago Amphitheater

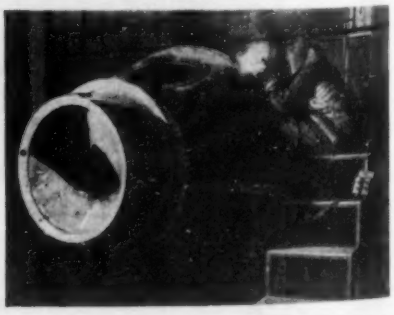
Oct. 18-25





HI-UP CONCRETE MIXER WELDED

The operator welds the mixing drum seam of a 2-cu. yd. Hi-Up Truck Mixer, using a Ransome welding positioner to rotate the drum. By utilizing a welding positioner, he can work at high speed because he can continue welding in the flat or downhand positions at all times.



To assure the high quality required in the manufacture of the Hi-Up concrete mixers, the welder uses Airco No. 230 shielded arc electrodes which were especially designed for use on pressure vessels, building structures and similar work where emphasis is placed on weld quality.

Guide vane assembly of Jeffrey Aerodyne mine-ventilating unit. This consists of 15 cast iron vanes welded between inner and outer rings of heavy-gauge steel sheet with 5/32" Ni-Rod electrodes.

● ● ●

Close-up of guide vane assembly. Note smooth appearance of welds. One bead around each corner is all that is needed to bond a vane securely to the steel rings.

How welding cast iron to steel with NI-ROD SAVED 300 OPERATIONS PER ASSEMBLY

The Jeffrey Manufacturing Company, of Columbus, Ohio ... makers of Aerodyne Fan mine ventilating units ... were looking for a faster, simpler method of building their large guide vane sections.

The stumbling block was the fact that the 15 vanes are *iron castings*. The inner and outer rings between which they are mounted, are *steel sheet*. Although welding seemed like the obvious answer, cast iron-to-steel joints have usually been a crossed-fingers proposition.

After experimenting with several electrodes, Jeffrey engineers remained convinced that their standard fabrication method was the only way.

Here's what they had to do: Four slots had to be cast into each vane. In the thin sections between each pair of slots, they drilled two rivet holes. Then they had to cut out 60 pieces of strip steel, drill them, and rivet them into the slots.

Add that all up and it amounts to this: 60 holes drilled in the vanes, 60 pieces of steel cut to size, 120 more holes drilled in the steel strips, and 60 rivets to set. That makes 300 time- and labor-consuming jobs on each assembly, not to speak of a difficult casting job to put the slots in the vanes, and the final step, welding the steel strips to the rims.

And then came NI-ROD with the solution they were seeking.*

Ni-Rod quickly furnishes strong, sound deposits between the iron and steel. The smooth weld beads run all the way around each corner of each vane ... and are made without preheating.

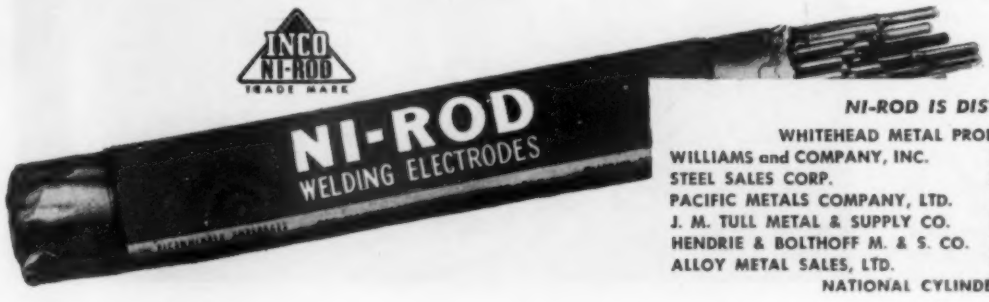
* * *

On the basis of this experience, look over your own fabricating operations. Perhaps Ni-Rod can save you time and money in your production lines. You'll also find Ni-Rod great for general maintenance and repair work.

Ni-Rod comes in 3/32", 1/8", 5/32" and 3/16" diameters. Order a 5-lb. package from your nearest NI-ROD distributor. And, be sure to ask for a copy of the Ni-Rod Instruction Booklet.

*Reg. U. S. Pat. Off.

THE INTERNATIONAL NICKEL COMPANY, INC.
67 Wall Street, New York 5, N. Y.



NI-ROD IS DISTRIBUTED BY:

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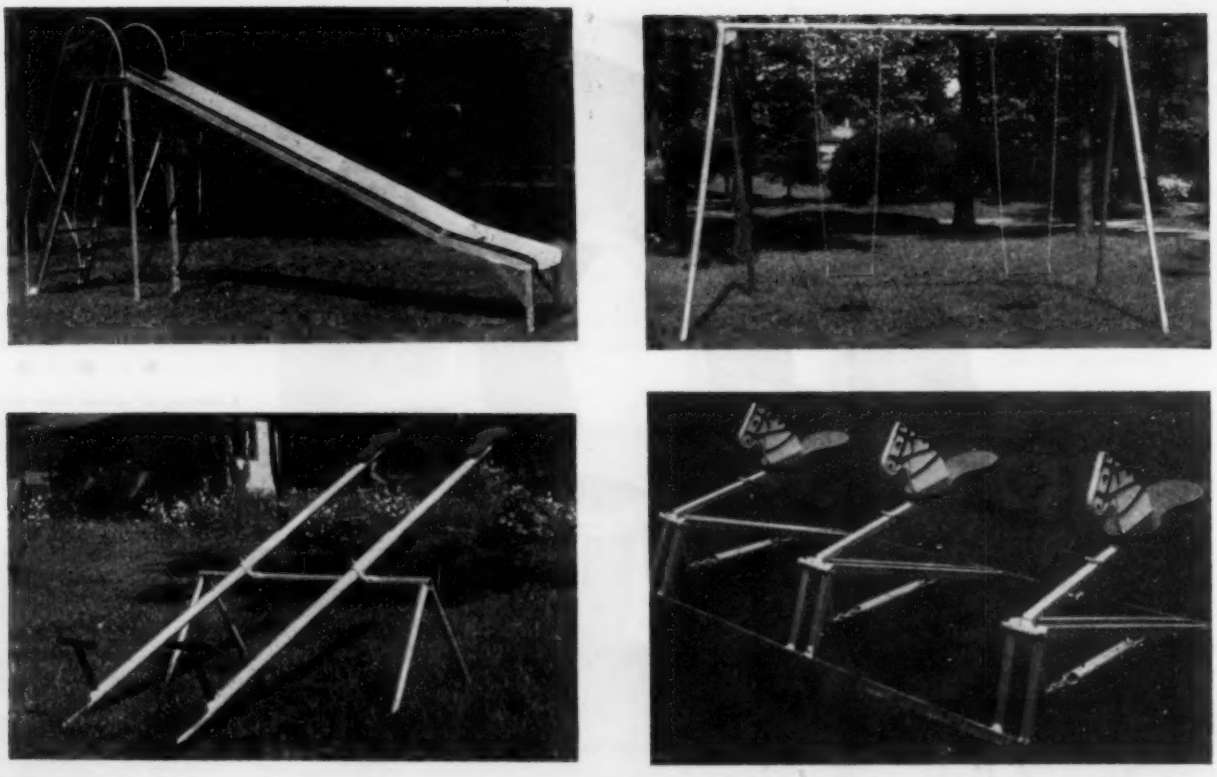


Welded Playground Equipment

PARIS PLAYGROUND EQUIPMENT CO. NEW INDUSTRY FOR PARIS

Paris has a new industry that promises to become very successful. This fall Paris Playground Equipment Co. will erect a building in the north end of the town. In the meantime the company is producing equipment in a temporary building just south of the western end of Keg Lane.

Mr. Donald Vance, of Paris, a qualified welder, started work on steel framework playground equipment about a year and a half ago primarily for the use of his little daughter. A friend saw some of the teeters, swings and slides and asked him to build some for the Creditville school grounds.

Orders came in from Princeton school for slides and teeters, from Paris Recreational Association. At this point there was too much work for one person, so Don interested Harold Curtiss, sheet metal foreman of Brantford Coach and Body to come in with him, and he in turn interested Wilfrid Attleberry, who had been personnel manager of the Brantford Coach and Body during the war.

Equipment was supplied to Delhi and Waterford and a sizable order has just been received from Aylmer Kinsmen Club.

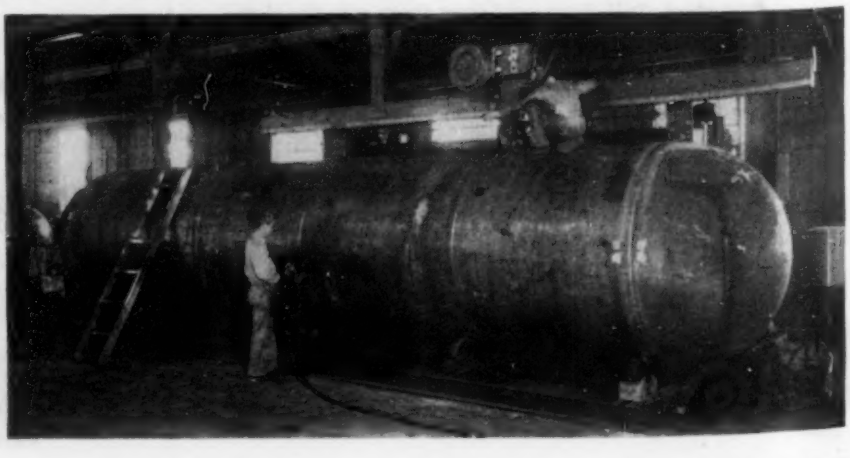
The company displayed its equipment at the Provincial Recreation Conference in May at McMaster University, where one of the interested spectators was Athletic Commissioner Sylvanus Apps. Selling point of the Paris Equipment Co. salesmen is that the steel framework is stronger and more durable than other types. It lasts longer and the price is right (no commercial plug intended).

The story of Don. Vance, who founded the company, is an interesting one. Nine years ago he lost both legs below the knees when he fell beneath a train. He was in the hospital in Toronto for three months. The Big Brothers organization of Toronto, Toronto and local businesses and organizations took an interest in the Paris boy and helped with hospital expenses and artificial limbs. After convalescence, Don. tried raising bull terriers, worked at Dave Gray's service station and the Sunshine Dairy. When the war came along he entered Cockshutt Plow Works, Aircraft Division, studied and passed his papers as a welder. Don. is a member of the AMERICAN WELDING SOCIETY.

AUTOMATIC TANK WELDING UNIT

Recently announced by Reed Engineering Co. of Cathage, Mo., and shown here is a new type positioning and welding unit for use with automatic welding heads in production of tanks, pressure vessels, boilers and other cylindrical shapes by the automatic welding method. Adaptable to any standard welding head, this unit combines both a variable speed work rotation and welding head support in one basic unit. Automatic welding head is mounted on the longitudinal track which operates parallel to the work and is power adjusted both vertically and laterally by remote control. The turning roll mechanism has infinite variable speed drive with multiple rubber-tired wheels for rotating and supporting the work. The entire unit can be quickly adjusted to any size vessel within its range and can also be used in conjunction with additional idler units for long work beyond the normal range of the machine. It is made in two sizes which are designated as the Model SD for work up to 84 in. diameter and Model SDH for work up to 120 in. diameter.

These units can be furnished in track lengths up to 40 ft. or can be used in pairs to provide dual operation on vessels up to 80 ft. in length.



ROD AND BAR STOCK *in a wide variety of shapes and sizes*

BECAUSE Mallory is the largest manufacturer of a complete line of Resistance Welding Electrodes, Holders, Dies and Accessories, we maintain a very large inventory of rod and bar stock in the various Mallory copper base alloys. Each of these alloys was developed by Mallory engineers for specific applications of spot, projection, seam, flash and butt welding.

	ROUNDS	RECTANGLES
MALLORY 3	1/8", 5/32", 3/16", 1/4", 5/16", 3/8" — Mill length approx. 11 feet 1", 1 1/16", 1 1/8", 1 1/4" — 1 3/4", 2", 2 1/4", 2 1/2", 3 1/8" — Mill length approx. 8 feet 3 1/8" — Mill length approx. 5 feet	1/8" x 1", 1/8" x 2", 5/16" x 3/4", 1/4" x 1", 1/4" x 1 1/2", 1/4" x 2", 3/8" x 3/4", 1/2" x 3/4", 1/2" x 1", 1/2" x 1 1/2", 1/2" x 2", 5/8" x 5/8", 5/8" x 1", 5/8" x 1 1/2", 3/4" x 3/4", 3/4" x 1", 3/4" x 1 1/2", 3/4" x 2", 3/4" x 2 1/2", 1" x 1", 1" x 1 1/2", 1" x 1 3/4", 1" x 2", 1 1/4" x 1 1/2", 1 1/2" x 1 1/2", 1 1/2" x 1 3/4", 1 3/4" x 2"
ELKALOY A	3/16", 1/4", 5/16", 3/8", 1/2", 5/8" — Mill length approx. 12 feet 2 1/2" — Mill length approx. 6 feet	3/8" x 3/4", 1/2" x 1/2", 1/2" x 1", 1/2" x 1 1/2", 5/8" x 1 1/2", 3/4" x 2 1/2", 1" x 1", 1" x 2", 1" x 2 1/2", 1 3/4" x 2"
MALLORY 100	1/4", 5/16", 3/8", 1/2" — Mill length approx. 8 feet 1 1/4", 1 1/2" — 2", 2 1/2" — Mill length approx. 4 feet	
MALLORY 73		5/8" x 1 3/4" x 43" long

The picture you see above is only a small part of this inventory carrying Elkaloy* A, Mallory 3, Mallory 100 alloys in many sizes and special shapes.

You can obtain these alloy rods and bars in a wide variety of shapes and sizes. Choose any of the dimensions shown at left, and your order will be handled promptly. Special sizes can be made to your requirements but delivery, naturally, will take longer. The optimum length for special forgings in small quantities is three feet.

In the United Kingdom, made and sold by MALLORY METALLURGICAL PRODUCTS, LTD. (An Associate Company of Johnson, Matthey & Co., Limited), Hatton Garden, London, E. C. 1

P. R. MALLORY & CO., INC.,
INDIANAPOLIS 6, INDIANA

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P. R. MALLORY & CO. Inc.

MALLORY

ELECTRODES — HOLDERS — SPECIAL DIES AND FIXTURES — ELKONITE*— ALLOY ROD AND BAR STOCK — FORGINGS — CASTINGS — ACCESSORIES

*REG. U. S. PAT. OFF.

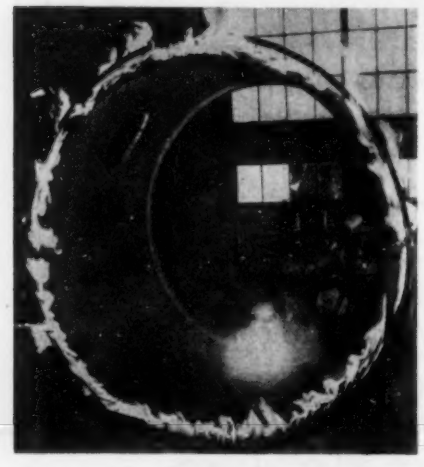
RESISTANCE WELDING MATERIALS

NEW PRODUCTS

The Society assumes no responsibility for the validity of claims in this Section

INDUSTRIAL CIRCUS DAYS

Remember when you were a boy and were thrilled by the acrobat leaping through the circle of flame? Here is its counterpart in industry. A number of ball mills, built by The J. P. Devine Mfg. Co. of Mount Vernon, Ill., required preheating for welding since they were constructed of both armor plate and mild steel. This preheating was done by having a gas line, with continuous pinhole outlets, extended around the end circumference of the shell. The photograph

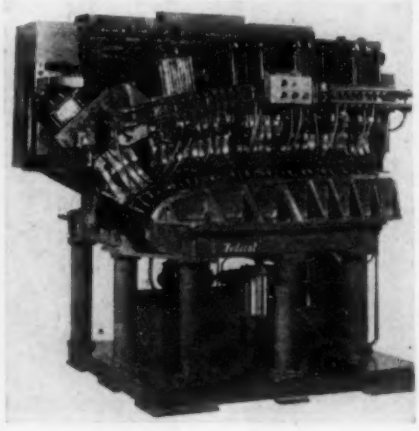


shows both the welding and the preheating in action. The "Shield-Arc LH-70" electrode and machines used were furnished by The Lincoln Electric Co., Cleveland, Ohio.

MULTI-POINT SPOT WELDER

The Federal Machine and Welder Co., Warren, Ohio, leading manufacturer of resistance welding equipment, announces the development of a new type Multi-Point Spot Welder for spot welding front fender stampings to fender rails for a popular make automobile. As the equipment is set up in the automobile plant, two left fender welders and two right fender welders provide a production in excess of 40 welded assemblies per hour per machine.

The fabricated steel main frame of the machine supports the stationary die unit and houses the welding transformers, clamping cylinders and sequencing control. The fabricated steel clamping arm, which holds the 32 spring-loaded point body units, is actuated by two cylinders through a system of toggle links. The fixture stroke of from 6 to 8 in. permits ease



of loading, unloading, dressing or changing of dies and electrodes.

Indexing of the fixture, operating of the welding guns, welding, and reversing of these operations, as well as unclamping, is fully automatic. Clamping of the work is by means of a separate push button control independent of the other operations.

Further details may be obtained by addressing The Federal Machine and Welder Co., 14 Dana St., Warren, Ohio.

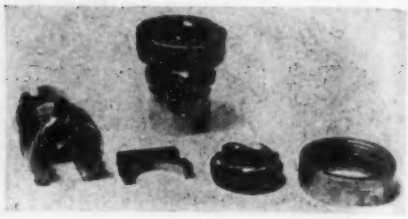
ELECTRODE TIP DRESSER

The introduction of the new Porter Electrode Tip Dresser to the resistance welding field makes possible the precision dressing of worn electrode points in a few seconds. The tool is adaptable to portable guns, short stroke stationary welders and multiple point welders.

The main feature of the Porter Electrode Tip Dresser is the floating Cutter Blade made of extremely hard wearing Tan-Tung steel. The blade floats in the chuck body causing uniform cutting action on both edges and correct centering of the electrode as the tip is reshaped. The compact construction of the Porter Electrode Tip Dresser permits worn electrodes to be dressed without removing them from the welder.

The outside diameter of the chuck is ground to 0.8755–0.8765 and can be press fit into most power dressing tools. In addition the chuck is threaded $^3/_8$–24 enabling it to be used on a portable drill, drill press or lathe.

A high-speed steel cutter ring is also incorporated in the tool for the proper dressing of the outside diameter of the electrode before it is actually floated into the tool. Body and nut of the tool are of case hardened S.A.E. 1112 steel.



For complete information and specific data on the Porter Electrode Tip Dresser write to the C. O. Porter Machinery Co., 666 Front Ave. N. W., Grand Rapids, Mich.

NEW HEAVY-DUTY D.C. ARC WELDERS

A new line of General Electric heavy-duty single-operator d.-c. arc welding machines, Type WD-40 series, has been designed for improved welding characteristics and a 50% saving in over-all size and weight. Operating at 3500 rpm., the new welders are available in 200-, 300- and 400-amp. N.E.M.A. ratings.

The arc is easily established and maintained with the new welders because more than full arc voltage is generated instantly after short circuit, thereby largely eliminating arc pop-out. Excessive weld spatter is reduced because current peaks are adjusted for best performance on any setting.

New single-dial, dual control combines flexibility and precision of dual control, both broad and precise, with the convenience of single-dial control. This feature makes it possible for the operator to preset the correct current for any given job without having to make other adjustments after the arc is struck.

With this current presetting arrangement, a tap switch handle, in the form of a pointer, is set to the electrode size being used. It then automatically points out the proper one of several graduated scales on the face of the current-setting dial. This indicates the current range which should be used and permits precise adjustment of the welder output.

Short-circuit current peaks are adjusted to provide a stable arc with optimum striking characteristics. Instant recovery voltage is never less than arc voltage on any current adjustment, assuring high-quality welding over the machine's entire range of current. This also facilitates striking the arc. Quick response and control of overshoot makes this machine favorable for vertical and overhead work without excessive spatter. A broad current range makes it possible for all models to handle a wide variety of work.

To facilitate inspection and maintenance, weather-resistant end covers on both the welder and the control box can be easily removed with a screwdriver, making the motor, generator, commutator, brushes and controls readily accessible.

The standard assembly includes a stationary welding generator, driving motor, control cabinet and panel and a motor starter assembled into a single, compact

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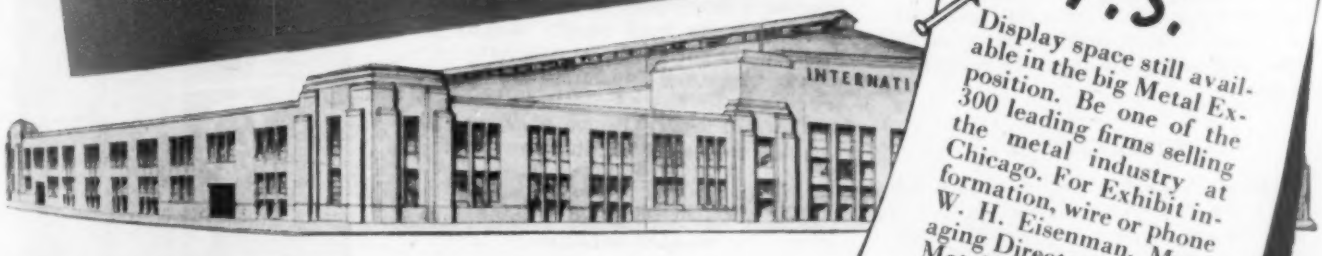
★ BE SURE TO SEE AND HEAR THE 29th NATIONAL METAL CONGRESS AND EXPOSITION—CHICAGO, SAT. OCTOBER 18 THRU FRI. OCTOBER 24



P. S.

Display space still available in the big Metal Exposition. Be one of the 300 leading firms selling the metal industry at Chicago. For Exhibit information, wire or phone W. H. Eisenman, Managing Director, National Metal Exposition, 7301 Euclid Avenue, Cleveland. ENdicott 1910.

Sponsored by the American Society for Metals, in cooperation with the American Welding Society, the Iron and Steel and Institute of Metals Divisions of the American Institute of Mining and Metallurgical Engineers, and the American Industrial Radium and X-Ray Society.

unit. A two-wheeled, balanced running gear is available as an optional feature.

Bulletin GEA-4852 gives additional information on the new line of welders.

MULTIPLE WELDER

Hot upsetting, spot welding and projection welding of intricate small parts to a steel panel are accomplished in one operation. The welder is an open-throated assembly of individually cont olled welding guns. Transformers and control equipment are compactly mounted on either side.

The parts to be welded are placed in a locating jig by one operator while another operator places another loaded jig over the retractable lower platen. Releasing jig drops all parts into lower dies. Meanwhile, operation on other side of machine is placing panel in position. An air cylinder then moves the platen up until a special contact is made with conductor from transformer, and upper electrodes, which are shaped to fit the parts, are in welding position. The upper electrodes can be positioned at will to accommodate other types of panels.

The welding regime can be set to any sequence desired by means of telephone jack-type control board. Operation on a perfectly balanced load on all three phases of the supply line is achieved by use of the exclusive Sciaky "three-phase" system.

Send for Bulletins 136 and 137-A. Address Sciaky Bros., Inc., 4915 W. 67th St., Chicago, Ill

PRESS TYPE SPOT AND PROJECTION WELDERS

A strikingly illustrated 12-page booklet (Bulletin No. 603) describing its complete new line of press type spot and projection welders and containing a wealth of information of value to the purchasing agent as well as to the design engineer has been made available by Progressive Welder Company, 3050 E. Outer Drive, Detroit 12.

In addition to carrying tables of specifications, installation dimensions, and rated spot welding capacities; data on standard features and standard extras; etc., there are numerous line drawings illustrating the theory and application of spot and projection welding, as well as phantom views to show details of machine construction.

These welders are currently available in 4 R.W.M.A. sizes; in standard KVA. ratings ranging from 50 to 500; and with a maximum throat depth of 36 in. on the spot welders and 30 in. on the projection welders.

TOGGLE CLAMP

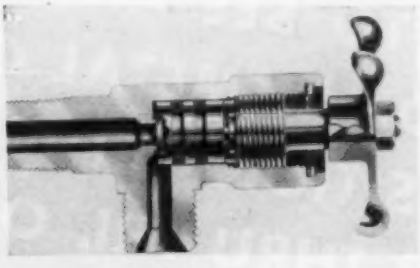
Detroit Stamping Co., manufacturers of De-Sta-Co production clamping tools is now manufacturing a new portable toggle clamp applicable to a variety of processes. Model 464 Plier Clamp was designed for sheet metal work, plastic sheet cementing or laminating, and other operations necessitating quick, positive pressure on relatively light gage materials up to $^3/_8$ in. total thickness. Toggle lock action holds parts in position for drilling, riveting,

welding, gluing on such products as sheet metal ducts, housings, cabinets of plastic, wood and metal, auto bodies and aircraft assemblies.

Claimed to be especially suitable for template locating, the new clamp is adjustable for efficient pressures on various thicknesses, provides firm hand grip for opening and closing. Nose is narrow for use in restricted spaces. Entire tool is forged and may be revamped for special application by welding, grinding, etc. To minimize wear, replaceable hardened steel bushings are used throughout. Descriptive bulletin available by writing to Detroit Stamping Co., Dept. K, 322 Midland Ave., Detroit 3, Mich.

VALVE FOR WELDING-GAS CYLINDERS

The SE-CO packless stem valve, an entirely new and safe design for oxygen and acetylene cylinders, has been announced by the Security Valve Co., 410 San Fernando Road, Los Angeles 31. Calif. The new valve will not freeze in either open or closed position. Moreover, it is impossible to disassemble this valve by turning the spindle past the open position. The combination of these two outstanding safety features at last eliminates the hazardous possibility of a welder accidentally or carelessly backing the spindle out of a valve in service on a cylinder or line containing gas at high pressure. The SE-CO valve is listed by the Underwriter's Laboratories, Inc.



Equipped with Neoprene "O" rings, as well as a Neoprene seat, the SE-CO valve also has a heavy-duty forged brass body and a full-grip hand wheel. Weight is 1.35 lb.; height is $4^1/_2$ in. open, $4^1/_2$ in. closed. Approved operating pressures are 1 oz. to 3500 psi.; operating temperatures are 70 to 250° F.; maximum open and close torque is 35 in.-lb.

NEW ELECTRODES FOR WELDING ALLOY STEEL

EutecTrodes 67 AC and 670 DC have a high alloy content developed for joining, filling, filleting and overlaying all types of steel where high tensile and impact strength, good heat, corrosion, wear resistance and high hardness values are required. It can also be used as an overlay material on cast iron. Many use it as a universal steel electrode.

EutecTrode 67 AC is a special flux-coated electrode for arc welding, and EutecTrode 670 DC is developed for d.-c. arc welding. It is fast flowing, smooth operating with no spatter and free from undercutting. Slag inclusion and poor fusion are eliminated by the washing of EutecTrode 67 on the sides of the groove. The weld metal can be deposited at the highest possible speed and with the least amount of base heat. When EutecTrode 67 is used at low-base metal heat, distortion and scaling is less, rejects are at a minimum, and production goes up.

EutecTrode 67 is available in sizes of $^3/_{16}$, $^5/_{32}$, $^1/_8$ and $^3/_{32}$ in. in diameter, manufactured by Eutectic Welding Alloys Corp., 40 Worth St., New York 13, N. Y.

P&H ANNOUNCES NEW A.-C. WELDERS

The Harnischfeger Corp., Milwaukee, Wis., manufacturer of P&H welding and materials handling equipment, announces a complete new line of a.-c. arc welders.

Designed and built by P&H, the welders offer a number of unusual features. All models are supplied with P&H "Dial-lectric" Control. This simplified control entirely eliminates the need for moving coils or cores, worm gears, sprockets and chain or lever adjustments. It is said by P&H that there is not a single moving part in the entire machine. Without cranks or plug-in stations, current selection is made simply by turning a single dial which requires but a three-quarter turn to cover the full welding range of the machine, from minimum to maximum capacity.

P&H "Dial-lectric" design makes striking the arc easy and instantaneous. The need for added or auxiliary current boosters is eliminated.

All industrial models of this new P&H series are designed for remote control. Indicated on the "Dial-lectric" control dial are two separate ranges, a high for general-purpose welding and another for light-gage welding. The new P&H a.-c.

arc welders are offered in intermittent industrial and heavy-duty models, ranging up to 625 amp.

Literature describing these welders may be procured by writing Harnischfeger Corp., Welding Division, 4400 West National Ave., Milwaukee 14, Wis.

SILVER SOLDER

All-State Welding Alloys Co., Inc., 96 West Post Road, White Plains, N. Y., announces the immediate availability of a new silver solder which has the advantages of high capillary action, exceptional tensile strength and good appearance after brazing. It is also particularly economical since its silver content is 20%—a proportion which has been found to give higher tensile strength than silver solders with a greater content of silver. Since it is so economical, it also makes possible many jobs that were not previously done with silver because of the prohibitive price. This alloy has a melting temperature of 1430° F. and a shear strength of 145,000 psi. It is particularly suitable for the brazing of carbide tips to steel shanks and for the fabrication of light steel parts. It is also recommended for use on steel, brass, copper, stainless steel and inconel. It is available in wire, strip or rings. This alloy, known as All-State No. 120 High-Strength Silver Solder, is used with All-State No. 103 flux.

INERT-ARC WELDER

A new Type WP 220–440-v. a.-c. welding transformer, designed specifically for use with the Inert-Arc welding process, has been announced by the Electric Welding Division of the General Electric Co. While especially suitable for welding aluminum, magnesium and beryllium copper in an atmosphere of argon gas without the use of flux, the new welder may also be used to weld a wide range of other metals and alloys. It is suitable for both manual and machine operation.

Built into a single compact unit are welding transformer, control panel, capacitors for power-factor correction, a bank of series capacitors to stabilize the arc, a pilot spark circuit for arc starting and water and gas solenoid valves. The entire assembly is enclosed in a sturdy drip-proof case, with electrical terminals and gas and water connections brought out to convenient outlets.

An indicator scale on the front of the welder shows the current setting. Welding current is controlled by turning a handle on top of the welder.

The pilot spark operates for only a fraction of a second during starting of the arc. A special control circuit shuts it off as soon as the arc starts, in order to prevent objectionable radio interference during welding.

In order to synchronize and control the operation of the pilot spark, gas and water solenoid valves, and a striking of the arc, a control panel has been built into the welder. After initial adjustments are made on the panel, all components of the

welder are operated by means of a simple foot treadle supplied with each machine. This allows the operator to devote his entire attention to the welding operation.

The control panel is connected so as to permit the independent operation of the gas and water valves to purge the gas lines of any air before welding is begun. This prevents the wild, uncontrollable arc resulting from air inclusions in the gas line, and lengthens the life of the tungsten electrode by preventing oxidation due to prolonged contact with air while the tungsten is hot.

The welders are readily mounted on an optional three-wheel running gear for portability. An easily removed back panel gives access to the interior for inspection and maintenance.

NEW DILLON TESTER HANDLES LARGER SPECIMENS

Testing longer specimens, as well as specimens that show considerable stretch, is an outstanding improvement effected by the new Dillon 1947 Hercules, Model L physical tester. This has been accomplished by lengthening the uprights to give a 13-in. spread between grips. A keyless power screw, which is prevented from turning by means of a special, ball-bearing-held yoke, permits exceptionally smooth operation, adds to life of main drive gear.

Additional features are the hardened steel sleeve to guide power screw, cast aluminum gear housing, ball-bearing power shaft supports, and an improved shock absorber screw.

Grips are quickly interchanged to handle tensile, transverse, compression, or shear tests.

The Model L is available in 7 ranges; 0–25 lb., 0-500 lb., 0–1000 lb. 0–2500 lb., 0–7500 lb. and 0–10,000 lb. It is supplied complete with gripping jaws and gage. Operation is manual, with motorization optional.

For further information, address W. C. Dillon & Co., Inc., 5410 West Harrison St., Chicago 44, Ill.

NEW WEAR-RESISTANT WELDING ROD FOR RAILROAD FIELD

The availability of the new Airco 28 Wear-Resistant Bronze Welding Rod was announced recently by the Air Reduction Sales Co. The manufacturer believes the new rod will find a wide acceptance in the railroad field. It is recommended for building up wear-resistant surfaces subject to heavy loads, especially where elevated temperatures are encountered. It is particularly suitable for building up worn piston heads, valve bull rings, driving box laterals, shoes, wedges, and similar wearing parts.

Laboratory test results showed deposits made with this new rod possess high weld strength, high hardness plus wear and corrosion resistance. The new Airco 28 Wear-Resistant rod averages 86.5 on the Rockwell B scale. Airco Hi-Test flux must be used to obtain best results with the new Airco 28.

For further information on this new bronze welding rod write Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y., or the Airco sales office nearest you.

STATION OUTLET VALVES

Air Reduction recently announced the availability of their new $^1/_2$-in. station outlet valves. A product of Airco research and development, the new valve is a compact combined shut-off and check valve for use on drops or risers of a piping system.

The new valve is a diaphragm type, and therefore being "packless" has no stuffing box. Performing a dual function, Airco's new station outlet valve eliminates the necessity of installing a separate shut-off valve and check valve.

As a shut-off valve it permits repairs or alterations to be made on equipment downstream from the valve without disturbing other stations on the line; as a check valve, it allows the flow of gas in only one direction and it will close tightly should a disturbance at the torch cause a back-pressure to travel as far as the valve.

Here are a few other distinctive features of Airco's new station outlet valve.

1. It is compact and of simple construction.
2. Being a diaphragm type valve, no stuffing box or packing is required, thus eliminating possible leaks.
3. Body, bonnet and handwheel are brass forgings.
4. Several outlets can be connected to one service drop—each outlet being entirely independent of the other.
5. It can be dismantled and reassembled easily and quickly.

The new valves are immediately available. For further information write Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y., or the Airco sales office nearest you.

ANNUAL MEETING
CHICAGO
HOTEL SHERMAN
OCT. 20-24

SECTION ACTIVITIES

DAYTON

The following are the officers of the Dayton Section for 1947–48:

Chairman, Carl F. Smith, Sight Feed Generator Co.; *Vice-Chairman*, B. A. Hausfeld, Dayton Fabricated Steel; *Treasurer*, George I. F. Theriault, Frigidaire Division; *Secretary*, Wm. P. Taylor, W. H. Kiefaber Co.

HARTFORD

The following are officers of the Hartford, Conn., Section for 1947–48:

Chairman, Richard H. Florian, Trumbull Elec. Mfg. Co.; *Vice-Chairman*, Stephan A. Zane; *Secretary*, D. E. Werts; *Treasurer*, Frank J. Wallace, Pratt & Whitney Aircraft Div.; *Program Committee*, John K. Ligh, Arcos Corporation; *Membership Committee*, Lewis D. Sykes, The Linde Air Products Co.

INLAND EMPIRE

The May 27th meeting was held in Coeur d'Alene, Idaho. Dinner at the Desert Hotel. Very good entertainment was furnished by Roy Haybarker and Babe Reynolds, members of the Section.

Following Section matters, W. H. Price, State Industrial Accident Commission Inspector presented a paper on "Safe Practices in Welding and the Importance of Codes and Tests," followed by an interesting open discussion.

R. F. Berger of the Inland Empire Refineries presented a paper on the subject, "Safe Practices in the Welding of Vessels Containing or Having Contained Petroleum Products." This brought on a very lively discussion entered into by most members and guests.

It was then announced that George Douglas, third speaker for the evening, had been unavoidably detained and that Robert Miles of Allied Weldery had volunteered to speak on the subject, "Safe Practices in the Handling of Oxygen and Acetylene." Mr. Miles' address was well received.

The June 24th meeting was held at the Wandermere Country Club, Spokane, Wash. A fine dinner was served by Chef Babe Reynolds and assistants. Chairman LaVelle introduced Stanley Hughes of Coeur d'Alene, who entertained on his accordian with some fine numbers.

After a number of Section matters were taken care of, a motion picture, "Steel Man's Servant," was shown through the courtesy of the U. S. Steel Corp. Another movie, "Carbon-Black Treasure," was shown through the courtesy of the National Carbon Co. A discussion on sequence in patch welding was conducted by Roland Johnson who first gave a talk on the subject. The ensuing discussion, in which many members took part, was very entertaining. Bob Miles presented U. S. Navy procedure for round patches.

LOS ANGELES

Old Timers' Night at Los Angeles, the last meeting of the year, prior to the summer recess, has become an annual institution. Started several years ago, it has proved to be an ideal way to end a successful season. Held this year on June 19th, at Scully's Cafe, the meeting was attended by about 80 members and 30 guests. Festivities were started by a "Community Sing," led by accordionist Betty Gordon. This innovation proved so popular that it was necessary to delay dinner by about an hour. Another innovation was the use of name buttons.

After dinner, Dave Bisbee conducted the installation of the new chapter officers:

Chairman, Al Fenlason; *Vice-Chairman*, E. O. Williams; *Secretary-Treasurer*, Charles Johnston.

C. P. Sanders gave an outline of the history of the local chapter and introduced a number of the old timers present, some of whom were gathered together for the group picture above.

Lee Delhi, our National President, was the chief speaker of the evening. He outlined his activities for the past year, and expressed great optimism for the future of welding, and of the WELDING SOCIETY. His remarks were well received by the audience.

The meeting was adjourned by our new chairman, Al Fenlason.

LOUISVILLE

The following officers have been elected by the Louisville Section for 1947–48:

Chairman, E. F. Schulz; *Vice-Chairman*, M. S. Noyes; *Secretary*, A. B. Doudna; *Treasurer*, Murray Davis. *Directors:* R. E. Morrison, G. W. Plinke, R. L. Hochstrasser.

MAHONING VALLEY

A stag party and annual meeting was held by the Mahoning Valley Section at the Dinner Bell, Youngstown, on May 23rd.

NEW JERSEY

A stag picnic and outing has been arranged by the New Jersey Section for Saturday, September 13th, at Farcher's Grove, Route 29, Union, N. J. The outing has been planned to start at 11 A.M. and last until six or later. Plenty of food and beer has been provided, and games planned with prizes, and five or six portable or table model radios as gate prizes. There is a public golf course and riding stables adjacent to the Grove, for those interested

NEW YORK

The New York Section is planning to schedule a paper on "Welding of Railroad Equipment" by Mr. Unger of the Pullman Standard Co., at its October meeting. The November meeting will probably be a joint meeting of the Metropolitan Section of the A.S.M.E. If this meeting is arranged, a paper will be secured from the Haynes Stellite Co. on the subject of "High-Temperature Alloys for Jet Engines."

In order to best serve the membership of the New York Section, a questionnaire has been prepared which will be sent to all members, soliciting suggestions as to type of meetings and arrangements which will best suit the Section members.

Plans are under way for having the newly elected District Vice-President present Past-Chairmen's pins to Past-Chairmen of the New York Section at the dinner preceding the September meeting.

PITTSBURGH

The following are the officers elected by the Pittsburgh Section for 1947–48:

Chairman, H. P. Schane, Mellon Institute of Industrial Research; *Vice-Chairman*, T. W. Morgan, American Rolling Mill Co.; *Secretary-Treasurer*, J. F. Minnotte, Minnotte Brothers Co. *Executive Committee:* (two years) E. H. Turnock, G. J. Green, Milton Male; (one more year to serve) H. E. Cable, John E. Mason, R. W. Emerson.

TOLEDO

The following officers have been elected by the Toledo, Ohio, Section for 1947–48.

Chairman, E. V. Newman, General Electric Co.; *Vice-Chairman*, Van S. Wielosinski, Willys-Overland Motors Co.; *Secretary-Treasurer*, Edwin Nafzger, Toledo Steel Tube Co.; *Program Committee*, Van S. Wielosinski; *Membership Committee*, W. H. Marion, Progressive Welder Co.

saves time!

saves materials!

saves costs!

NCG

EVERYTHING FOR WELDING

NCG is recognized as one of the largest organizations of its kind in the world. It operates 73 manufacturing plants within the United States, offers supply and service by a vast network of hundreds of independent NCG distributors and warehouse stocks. For assured satisfaction in *your* welding and cutting needs . . .

RELY ON NCG

Many a cost accountant is beaming approval these days for the way Torchweld is upping *profits* in shops and plants, large and small, all over America. They say they can see *immediate* results—in higher productivity and in lowered expenditures of time and materials.

In every flame welding and cutting operation, they report, Torchweld is saving time—in more than one way. First of all, experienced welders *like* Torchweld—they tackle their jobs with an assurance and enthusiasm born of *respect* for good tools. And Torchweld apparatus actually does weld faster and cut faster, as proved repeatedly in shop operation. Further, work is never rejected for imperfections due to equipment failure.

Materials, too, are saved in more than one way. The "75" cutting torch, for instance, cuts a minimum narrow kerf, conserving waste that can run into considerable tonnage. The pre-heat flame of the "75" is concentrated on the path to be cut, so adjacent metal is not needlessly heated, wasting gases. The welding flame of the famous "54" welding torch has the same frugal characteristic—and the "Stab-L-Flow" mixer that stabilizes the welding flame assures more bead from every rod used.

It's not surprising, however, that *every* item in the Torchweld line possesses features like these—that *save* costs. NCG has built 30 years' experience in all phases of welding into Torchweld. This intimate knowledge, kept alive by constant nation-wide research into welding applications, is bound to find expression in apparatus of unusual merit.

Write *today* for the new, complete Torchweld catalog that will prove to you that Torchweld can up profits in *your* business, too.

NATIONAL CYLINDER GAS COMPANY
840 N. MICHIGAN AVE., CHICAGO 11, ILL.

ABSTRACTS OF CURRENT WELDING PATENTS

Prepared by V. L. Oldham

Printed copies of patents may be obtained for 25¢ from the Commissioner of Patents, Washington 10, D. C.

2,423,096—Electric Welding Apparatus—Gilbert Gilliver, inventor, London, England, assignor to Standard Telephones and Cables Limited, London, England. (6 Claims)

This apparatus is for fuse welding conductors and it clamps the conductor ends in fixed position with respect to an electrode with a shutter normally between the conductors and electrodes. Special means are provided to bring the electrode into contact with the ends and to withdraw the shutter.

2,423,165—Welded Blade Structure—Robert C. Allen, Inventor, Wauwatosa, Wis., assignor to Allis-Chalmers Mfg. Co. (5 Claims)

A welded turbine blade is covered in this patent.

2,423,188—Skelp Edge Welding—Harry T. Herbst, Inventor, Baltimore, Md., assignor to Union Carbide and Carbon Corp. (14 Claims)

Herbst's patent covers tube manufacturing apparatus wherein a carriage adjustably positions a pair of burners for heating the edges of skelp so that different widths of skelp can be processed. Remote control adjustment means regulate the positions of the burners.

2,423,189—Hammer Type Weld Cleaning Tool Having Attached Bit Removers—Jack C. Honhart, Inventor, Detroit, Mich. (1 Claim)

A special tool which may be used for cleaning welds is shown in this patent, which tool has a leaf spring for controlling the position of drift pins that, in turn, control the position of operative instruments associated with the tool.

2,423,320—Welder's Helmet—Samuel C. Hurley, Jr., Inventor, Danville, Ill. (4 Claims)

Two polarized elements are provided in the vision opening of this eye shield construction with one element being rotatable for reducing the light transmittal. A photoelectric device is provided for controlling means that rotate one polarized element to regulate light transmittal into the helmet.

2,423,324—Welder Handle—Vernon R. Johnson and Lester W. Wachter, Inventors, Streator, Ill., assignors to Anthony Development Co. (7 Claims)

The novel handle includes a piston slidably carried in the handle and extending therefrom for mounting an electrode. A spring urges the piston inwardly of the handle and air pressure is provided for forcing the piston outwardly of the handle.

2,423,515—Repetitive Blanketed Electric Fusion Welding with High-Frequency Starting—Edward D. Morris, Inventor, Chicago, Ill assignor to The Linde Air Products Co (1Claim)

In Morris' welding process, a fusible electrode in the welding circuit is spaced from the end of the work by a bridge of solid, mineral-like welding material which is substantially nonconductive when cold. The welding circuit has a source of welding energy connected thereto and also a high-frequency power supply so that sparking occurs at the electrode across the bridge of welding material and a conductive path is created to initiate fusion welding action under the blanket of weld material.

2,423,758—Electrode Holder—Thomas S. Donnelly, Inventor, Detroit, Mich. (2 Claims)

Donnelly's holder has a cup shaped, tapped cup member adapted to receive a butt end of an electrode and to engage with an insulated handle member through special connection members.

2,423,810—Manufacture of Bimetal—Joseph M. Goulding, Inventor, Fairhaven, Mass., assignor to Revere Copper and Brass, Inc. (10 Claims)

This welding method relates to the welding of one slab of metal to another and comprises hermetically boxing metal slabs in a container having frangible portions adjacent the slab edges, and heating the boxed slabs to welding temperatures. The boxed slabs are pressed together and elongated when at their welding temperature.

2,423,811—Welding Assembly—Joseph M. Goulding, Inventor, Fairhaven, Mass., assignor to Revere Copper and Brass, Inc. (11 Claims)

The patented assembly is that used in Patent 2,423,810 and comprising the metal slabs and the associated frangible box in which the slabs are sealed.

2,424,324—Arc Welder—Slavo J. Murcek, Duquesne, and Robert W. Price, Murrysville, Pa., Inventors, assignors to Westinghouse Electric Corp. (22 Claims)

A weld control system is provided and it includes electric valve means connected between a weld current source and the weld load. Means for developing a voltage dependent upon the load are present, and control means responsive to the voltage regulate the valve means to maintain a substantially constant load current.

2,424,437—Welder's Heat Guard—Wallace R. Dent, Inventor, Chicago, Ill. (2 Claims)

Dent's patent covers a heat dissipating guard which is adapted to be mounted in adjustable spaced relation to a handle of a weld tool.

List of New Members

July 1 to July 31, 1947

BOSTON

Bramhall, Richard O. (B), 25 Parker St., Lexington, Mass.

Hackett, Barrie A. (B), 1497 Elmwood Ave., Cranston, R. I.

CHICAGO

Geiger, Harold L. (B), International Nickel Co., 333 N. Michigan Ave., Chicago 1, Ill.

Stewart, Roy L. (C), 3403 W. Jackson Blvd., Chicago 24, Ill.

CLEVELAND

Carpenter, Otis R. (A), The Babcock & Wilcox Co., Barberton, Ohio.

RACO COMPOSITE TYPE "A"
REID-AVERY COMPANY
INCORPORATED
DUNDALK • BALTIMORE 22 • MARYLAND
SINCE 1919 PRODUCERS OF ARC WELDING ELECTRODES AND WELDING RODS

COLORADO

Nelson, Manley R. (A), General Iron Wks. Co., P. O. Box 2490, Denver 1, Colo.

COLUMBUS

Robinson, William A. (C), National Cylinder Gas Co., 100 N. Skidmore St., Columbus, Ohio.

DETROIT

Berry, Arthur R. (B), 3623 North St., Baton Rouge 9, La.
Braun, Arnold O. (B), 8605 Livernois Ave., Detroit 4, Mich.

KANSAS CITY

Elcock, Edwin S. (B), Masonic Temple, Topeka, Kan.
Stingley, W. M. (B), 121 W. 21st St., Topeka, Kan.

LOS ANGELES

Burns, Robert W. (C), 427 N. Hudson, Pasadena 4, Calif.
Coops, Stewart E. (C), 101 S. Olive St., Alhambra, Calif.

MILWAUKEE

Friebel, George J. (A), Harnischfeger Corp., 4400 W. National Ave., Milwaukee 14, Wis.
Meyer, Arnold F. (A), The Heil Co., 3000 W. Montana St., Milwaukee 1, Wis.

NEW JERSEY

Horning, Randall M. (C), Canadian Kellogg Co., Station M., Box 250, Montreal, Quebec, Canada.
Scott, Joseph F. (A), Deputy Commissioner, Dept. of Labor, State House, Trenton 7, N. J.

NEW ORLEANS

Houppert, J. F. (B), P. O. Box 116, Harvey, La.
Hughes, William I. (B), Hughes Welding Supply Co., Box 116, Shreveport 87, La.
Sarrat, Donald M. (C), Gulf Welding Equipment Co., 1133 Magazine St., New Orleans 13, La.

NEW YORK

Mudge, W. A. (A), The International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.

NORTHWEST

Simning, R. W. (C), Universal Welding & Mfg. Co., 2837 Second Ave. So., Minneapolis 8, Minn.

PASCAGOULA

Spooner, E. C. (C), Rt. 1, Box 116, Wilmer, Ala.

PEORIA

Colin, Jr., Edward C. (D), 410 Chalmers, Champaign, Ill.

SAN FRANCISCO

Johnson, Floyd Frederick (B), 1805 Francisco St., Berkeley 3, Calif.
Stump, Rufus A. (B), Central Iron Wks., 442 Webster St., San Francisco 17, Calif.

SOUTH TEXAS

Guise, Sr., J. J. (C), 1102 Bomar 4, Houston, Tex.

TOLEDO

Ostrosky, Carl F. (A), Tool & Welding Engr., Research, Spicer Mfg., Div. of Dana Corp., Toledo 1, Ohio.
Roberts, George R. (C), Cordova Hotel, 17th & Madison Sts., Toledo, Ohio.

WICHITA

Carter, Paul D. (C), 607 S. Hydraulic, Wichita, Kan.
Kenney, Roger W. (C), 2752 Mason Terrace, Wichita, Kan.
Waugh, Duane I. (C), P. O. Box 195, Belle Plaine, Kan.

YORK-CENTRAL PA.

Wisler, Charles R. (B), United Sound & Signal Co., Inc., Columbia, Pa.

NOT IN SECTIONS

Pech, Warren E. (B), Pech Welding Shop, 104 N. Fourth St., Fairfield, Iowa.
Ulloa, Carlos (C), Casilla 4587, Santiago, Chile, South America.
Verzillo, Dott. Ing. Rienzo (B), Direzione General FF. SS., Viole Regina Margherita 58, Firenze, Italy.

Members Reclassified

During Month of July

PHILADELPHIA

McClung, Jr., E. R. (C to B), Lukenweld, Inc., Coatesville, Pa.

TOLEDO

Marion, William H. (C to B), 320 Ontario St., Toledo, Ohio.

NEW CONSULTING AND RESEARCH ORGANIZATION ON POWDER METAL PARTS

A new corporation devoted to consultation, research and development in the field of powder metallurgy—Sintercast Corporation of America, New York City—has been formed by Erwin Loewy, president of Hydropress, Inc., and two associates, Dr. Claus G. Goetzel and John Ellis. The new organization offers to industry a means of applying the latest techniques and newest developments in the rapidly complicating field of powder metal parts production. Sintercast is currently establishing complete research and pilot-production facilities, so that it can carry clients' projects through laboratory development to full-scale production.

CONSTANTINE JOINS ELLIOT CO.

The Elliott Company of Jeannette, Pa., announces the appointment of Mr. L. R. Constantine as welding engineer. Mr. Constantine is a graduate of Lehigh University and was formerly employed by Dravo Corp. and M. W. Kellogg.

NATIONAL CYLINDER BUYS INDEPENDENT OXYGEN CO.

As of August 1st, Independent Oxygen Company has been sold to the National Cylinder Gas Company of Chicago.

The former President Mr. G. V. Dye who is a member of the AMERICAN WELDING SOCIETY also owns the Dye Welding Supply Company, Houston, and will now give his full time to this company.

ENGINEERING COLLEGE RESEARCH

In 1944 and 1945 the Engineering College Research Association published a "Directory of Member Institutions and Their Principal Fields of Research."

This year, following the merger of the Engineering College Research Association into the American Society for Engineering Education, the Executive Committee of the Engineering College Research Council authorized publication of a new edition of the "Directory of Member Institutions" in a revised form.

First copies of the new publication, entitled "Directory of Member Institutions and Review of Current Research," were distributed at the Annual Meeting of the Research Council in Minneapolis. The publication attracted considerable attention at that time and was accorded a warm welcome from many of those interested in increasing the influence of research in engineering colleges and universities.

Price of $1.00 per copy has been established. Copies are available from the Engineering College Research Council's offices at the State University of Iowa.

TENTATIVE PROGRAM

AMERICAN WELDING SOCIETY
TWENTY-EIGHTH ANNUAL MEETING
WEEK OF OCTOBER 19, 1947

HOTEL SHERMAN, CHICAGO, ILL.

WELDING AND CUTTING EXHIBITS AND DEMONSTRATIONS

NATIONAL METAL EXPOSITION

INTERNATIONAL AMPHITHEATRE

HOURS OF THE EXPOSITION

Saturday, Sunday, Monday, Tuesday and Wednesday—October 18 to 22
12 Noon to 10:30 P.M.
Thursday and Friday—October 23 and 24
10:00 A.M. to 6:00 P.M.

Admission by special invitation or by A.W.S. registration badge or membership card of any participating technical Society.

TECHNICAL SESSIONS

All Technical Sessions will positively start on time.

No Stenotype Reporter—Members desiring to discuss papers are urgently requested to prepare discussion in writing in advance of the meeting and to send copies to Headquarters, as those preparing written discussion will be given preference at the session. Members and guests giving extemporaneous discussion at meeting should forward a written discussion as soon as possible after the meeting.

PRESIDENT'S RECEPTION
SUNDAY, OCTOBER 19th, 5 to 7 P.M.
Louis XVI Room, First Floor

MONDAY, OCTOBER 20th, Morning—9:30 A.M.
THREE SIMULTANEOUS SESSIONS

Chairman—R. E. McFARLAND,
Western Electric Co.

Vice-Chairman—C. O. DRUETZLER,
Electro-Motive Div., General Motors Corp.

GENERAL PAPERS
Ballroom

Directional Welding to Minimize or Eliminate Distortion in Weldments and Control Residual Stresses
by JOSEPH HOLT, Consulting Engineer

Precision Pressure Regulation of Various Gases
by J. K. HAMILTON, Air Reduction

Welded Fabrication
by RAY STITT, R. C. Mahon Co.

Chairman—J. W. SHEFFER,
American Car & Foundry Co.

Vice-Chairman—T. B. JEFFERSON
The Welding Engineer

RAILROAD WELDING
Louis XVI Room

Flame-Hardening Locomotive Brake and Spring Rigging Pins and Bushings
by B. W. COVELL, Northern Pacific Railway Co.

End-Hardening of Rails and Open-Hearth Frogs
by R. W. TORBERT, The Oxweld Railroad Service Co.

New Developments in Railroad Maintenance-of-Way Work
by C. A. DALEY, Air Reduction

Problems in Resistance Welding Stainless Steel Railway Car Structures
by J. VAN DEN BEEMT, The Budd Co.

Chairman—L. S. McPHEE,
Whiting Corp.

Vice-Chairman—E. VOM STEEG, JR.,
General Electric Co.

AIR CONDITIONING AND REFRIGERATORS
Crystal Room

Welding in Assembly Line Production of Refrigerator Cabinets
by P. BOWMAN, Seeger Refrigerator Co.

High-Speed Automatic Oxyacetylene Welding
by H. O. JONES, Air Reduction Sales Co.

Monday Afternoon — Visit Welding and Cutting Exhibits

Monday Evening—8:00 P. M.

Ballroom

Chairman—L. W. DELHI,
California Steel Products Co.

Vice-Chairman—E. V. DAVID,
Air Reduction Sales Co.

AWARDS OF PRIZES AND MEDALS

ADAMS LECTURE

Structural Strength of the Welded Joint
by G. S. MIKHALAPOV, Air Reduction Sales Co.

TUESDAY, OCTOBER 21st, Morning—9:30 A. M.

THREE SIMULTANEOUS SESSIONS

Chairman—I. B. HARTER,
Babcock & Wilcox Tube Co.

Vice-Chairman—T. C. FETHERSTON,
Union Carbide & Carbon Corp.

PRESSURE VESSELS

Louis XVI Room

Welding of Locomotive-Type High-Pressure Boilers
by GEORGE M. TREFTS, Farrar and Trefts, Inc.

Carbon Arc Welding of Copper Pressure Vessels
by JOHN J. VREELAND, Chase Brass & Copper Co.

Integral Cast Bosses for Pressure Vessels
by H. L. ANTHONY and H. P. SCHANE, Scaife Co.

Development of Butt-Welded Joints in Pressure Vessels
by EDWIN J. BROWN, Union Iron Works

Chairman—H. O. HILL,
Bethlehem Steel Co.

Vice-Chairman—K. W. OSTROM,
K. Wm. Ostrom & Co.

MISCELLANEOUS

Crystal Room

Multi-Flame Pressure Welding Process
by N. H. CUKE, Canadian Liquid Air Co. Ltd.

Controlled Low-Temperature Stress-Relieving of Welded Tanks for Wet Seal Gas Holder
by R. KRAUS, Stacey Bros. Gas Construction Co.

Composite Alloy Fabrication with the Hidden Arc
by H. E. CABLE, Lincoln Electric Co.

Semi-Automatic Welding with Standard Manual Arc-Welding Equipment
by F. W. MYERS, Jr., Watertown Arsenal

Chairman—J. J. CROWE,
Air Reduction Sales Co.

Vice-Chairman—G. E. DOAN,
Lehigh University

RESEARCH

Ballroom

Determination of Physical Chemical Factors in Stress Corrosion Cracking of Mild Steel
by H. J. McDONALD and M. G. WINTERSTEIN, Illinois Institute of Technology

Some Unusual Features Encountered in Investigating Cracked Welds in 35/15 Magnesium Retorts
by H. J. NICHOLS, Dept. of Mines and Resources, Ottawa, Ontario, Canada

Distribution of Strength and Ductility in Welded Steel Plate as Revealed by the Static Notch Bar Tensile Test
by W. F. BROWN, Jr., L. J. EBERT and G. SACHS, Case Institute of Technology

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Tuesday Afternoon—2:00 P. M.

THREE SIMULTANEOUS SESSIONS

Chairman—D. H. COREY,
The Detroit Edison Co.

Vice-Chairman—R. W. CLARK,
General Electric Co.

PIPE AND MAINTENANCE WELDING

Louis XVI Room

Metallurgical Properties of High-Yield Strength Seamless Line Pipe
by A. B. WILDER and J. D. TYSON, National Tube Co.

The Maintenance Weldery
by CLEO E. HOOK, Noblitt Sparks Industries, Inc.

Building, Repairing and Design of Farm Machinery
by ERNEST J. KOOP, Ernest J. Koop Welding & Blacksmith Shop

Chairman—G. E. CLAUSSEN,
Reid-Avery Co.

Vice-Chairman—A. R. LYTLE,
Union Carbide & Carbon Res. Labs.

RESEARCH

Ballroom

Low Temperature Charpy Tests of Various Ferritic Weld Deposits
by W. B. BUNN, The M. W. Kellogg Co.

The Effect of Titanium and Vanadium on the Mechanical Properties and Weldability of Experimental Low Alloy High Tensile Steel
by GEORGE G. LUTHER, CARL E. HARTBOWER, and DONALD B. ROACH, Naval Research Laboratory

Effects of Section Size on the Static Notch Bar Tensile Properties of Mild Steel Plate
by W. F. BROWN, Jr., J. D. LUBAHN and L. J. EBERT, Case Institute of Technology

Chairman—H. C. BOARDMAN,
Chicago Bridge & Iron Co.

Vice-Chairman—WM. E. CRAWFORD,
A. O. Smith Corporation

HIGH ALLOYS

Crystal Room

Welding and Fabrication of High-Temperature Alloys
by C. G. CHISHOLM, Haynes Stellite Co.

Some Factors Controlling the Ductility of 25 Cr–20 Ni Weld Deposits
by O. R. CARPENTER and N. C. JESSEN, Babcock & Wilcox Co.

Selection of Austenitic Electrodes for Welding Dissimilar Metals
by ANTON L. SCHAEFFLER, Arcos Corp.

Tuesday Evening—7:45 P. M.

UNIVERSITY RESEARCH CONFERENCE

WEDNESDAY, OCTOBER 22nd, Morning—9:30 A. M.

THREE SIMULTANEOUS SESSIONS

Chairman—R. E. POWELL, Western Electric Co.

Vice-Chairman—G. N. SIEGER, S-M-S Corporation

RESISTANCE WELDING

Louis XVI Room

Flash Welding of the Structural Aluminum Alloys
by R. CONDIT BECKER and ROBERT M. CURRAN, Rensselaer Polytechnic Institute

Some Metallurgy Aspects of Carbon Steel Spot Welding
by JULIUS HEUSCHKEL, Westinghouse Research Laboratories

Engineering Symposium of Future Control of Resistance-Welding Machine
by C. E. SMITH, Taylor-Winfield Corp.

A Study of Projection Welding
by W. F. HESS and WYLIE J. CHILDS, Rensselaer Polytechnic Institute

Chairman—HARRIS A. GOODWIN, The Bastian-Blessing Co.

Vice-Chairman—HENRY BOOTH, Shawinigan Products Corp.

CUTTING

Ballroom

Powder Cutting as a Production Tool
by D. H. FLEMING, Jr., The Linde Air Products Co.

The Theory of Oxyarc Cutting,
by H. C. CAMPBELL, Arcos Corp.

Flux Cutting Alloy Steels
by G. E. BELLEW, Air Reduction

Oxyacetylene Production Cutting in Steel Mills
by A. H. YOCH, and W. BEGEROW, Air Reduction Sales Co.

Chairman—C. H. HERTY, Bethlehem Steel Co.

Vice-Chairman—CAPT. L. V. HONSINGER, Bureau of Ships

SHIP STRUCTURES RESEARCH

Crystal Room

Causes of Cleavage Fracture in Ship Plate—Tests of Wide Notched Plates
by A. BOODBERG, H. E. DAVIS, E. R. PARKER and G. E. TROXELL, University of California

Cleavage Fracture of Ship Plates as Influenced by Size Effect
by W. M. WILSON, R. A. HECHTMAN and W. H. BRUCKNER, University of Illinois

A Study of Internally-Notched Tensile Specimens for Evaluating the Toughness of Structural Steel
by H. R. THOMAS and D. F. WINDENBURG, DAVID TAYLOR, Model Basin, U. S. N.

Investigation of Steels Removed from Fractured Ships
by G. A. ELLINGER and MORGAN L. WILLIAMS, National Bureau of Standards

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Wednesday Afternoon—2:00 P. M.

THREE SIMULTANEOUS SESSIONS

Chairman—JOHN D. GORDON, Progressive Welder Co.

Vice-Chairman—B. L. WISE, National Electric Welding Machine Co.

RESISTANCE WELDING

Louis XVI Room

The Heat Treatment Spot Welds of Steel Plate
by W. D'ORVILLE DOTY, WYLIE J. CHILDS and W. F. HESS, Rensselaer Polytechnic Institute

The Development and Application of Quality Control Techniques to Resistance Welding Production
by O. C. FREDERICK, General Electric Co.

Shunt Circuit Impedance in Spot Welding
by ROBERT BLAIR, Taylor-Winfield Corp.

Chairman—G. O. HOGLUND, Aluminum Company of America

Vice-Chairman—C. H. JENNINGS, Westinghouse Electric Corp.

NONFERROUS

Crystal Room

Arc Welding Copper and Copper-Base Alloys
by F. E. GARRIOTT, Ampco Metal, Inc.

Static-Strength Tests of Fillet Welds on Aluminum Alloy 61S-T Plate
by R. L. MOORE, Aluminum Co. of America

Welding of Bronze Gears with a Steel Web and Hub
by OTTO D. KLUG, Alloys Welding Specialists Co.

Chairman—EARL R. PARKER, University of California

Vice-Chairman—FINN JONASSEN, National Research Council

SHIP STRUCTURES RESEARCH

Ballroom

The Work of the Ship Structures Committee
by REAR ADMIRAL ELLIS REED-HILL, Chairman Committee, U. S. Coast Guard

Tests of Various Designs of Welded Hatch Corners for Ships
by E. PAUL DeGARMO, University of California

Correlation Investigations of Small Specimens with Wide Plate Tests
by MAXWELL GENSAMER, E. P. KLIER and S. C. WAGNER, Penn State College

A Method of Evaluating Transition from Shear to Cleavage Failure in Ship Plate and Its Correlation with Large Scale Plate Tests
by NOAH A. KAHN and EMIL A. IMBEMBO, New York Naval Shipyard

LADIES' ENTERTAINMENT

(To Be Announced Later)

Charges for Technical Session papers are:
October Journal and "Preprint" each 50¢ per copy to members; $1.00 to non-members.

THURSDAY, OCTOBER 23rd, Morning—9.30 A. M.

THREE SIMULTANEOUS SESSIONS

Chairman—O. B. J. FRASER,
International Nickel Co.

Vice-Chairman—A. M. UNGER,
Pullman-Standard Car Mfg. Co.

LOW ALLOY STEELS

Louis XVI Room

Factors Affecting Weldability of Carbon and Alloy Steels
by C. E. JACKSON, K. H. KOOPMAN and C. M. OFFENHAUER, Union Carbide & Carbon Research Labs.

Submerged Melt Welding of Steels of High Hardenability
by E. A. CLAPP and E. L. FROST, Union Carbide & Carbon Research Labs.

Macro-Etching and Photomacrography of Ferritic and Austenitic Welded Joints in Low-Alloy Steel
by O. O. MILLER and E. G. HOUSTON, United States Steel Corp.

Chairman—J. LYELL WILSON,
American Bureau of Shipping

Vice-Chairman—ROSS J. YARROW,
Consolidated Iron & Steel Mfg. Co.

MISCELLANEOUS

Crystal Room

Design of Arc-Welded Steel and Its Relation to Cost
by R. H. DAVIES, Lincoln Electric Co.

High-Speed Technicolor Motion Picture of Welding Arc
by G. E. CLAUSSEN, Reid-Avery Co.

High-Speed Heliarc Welding
by H. E. ROCKEFELLER, The Linde Air Products Co.

Stud Welding
by R. C. SINGLETON, Nelson Sales Corp.

Chairman—T. R. HIGGINS,
American Institute of Steel Construction

Vice-Chairman—A. F. DAVIS,
Lincoln Electric Co.

STRUCTURAL

Ballroom

Design and Construction of Welded Research Laboratory Building
by LaMOTTE GROVER, Air Reduction

Shape-Welding by the Submerged Melt Welding Process
by J. A. KRATZ, The Linde Air Products Co.

Studies on Effect of Red Lead Paints on the Quality of Metal-Arc Welds in Structural Steel
by R. W. BENNETT, R. D. WILLIAMS and C. B. VOLDRICH, Battelle Memorial Institute

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Thursday Afternoon — Visit Welding and Cutting Exhibits

Thursday Evening

ANNUAL BANQUET

Grand Ballroom, Mezzanine

7:00 P.M.

FRIDAY, OCTOBER 24th, Morning—9:30 A. M.

Chairman—HENRY O. KLINKE,
Air Reduction Sales Co.

Vice-Chairman—A. M. CANDY,
Hollup Corporation

INERT GAS WELDING

Louis XVI Room

Mechanized Inert-Gas-Shielded Arc Welding
by H. T. HERBST, The Linde Air Products Co.

New Applications of Inert Arc Welding
by R. W. TUTHILL, General Electric Co.

Friday Afternoon

2:00 P.M.
BUSINESS SESSION
Crystal Room

3:00 P.M.
BOARD OF DIRECTORS MEETING
Room 118